Putting It All Together: What Is The Modern Algorithm For Management Of Massive And Submassive PE

Ido Weinberg, MD
Medical Director, VASCORE
Assistant Professor of Medicine
Harvard Medical School
Massachusetts General Hospital

Disclosures
• Scientific Advisory Board – Novate Medical
• Non compensated consultant - BTG

Start Anticoagulation Early. Remember: LMWH >> UFH

Cochrane Database Syst Rev. 2017 Feb 9;CD001100

Not all PE are Created Equal

PE are Defined by Hemodynamic Significance

Thrombolysis in PE: Multiple Positive Physiological Effects
• Improved early clot resolution
• Reduced pulmonary arterial pressure
• Improved lung perfusion
• Improved early angiographic flow

PIOPED Investigators. Chest. 1990; 97: 528-33
Goldhaber SZ. et al. Lancet. 1993; 341(8844): 517-11
Daniels LB. AJC. 1997; 80: 184-8
There is One Obvious Downside...

Thrombolysis Performed Better Than Anticoagulation for Massive PE

For catheter based therapies to be considered in massive PE, rapid implementation needs to be available

ECMO Reduces Mortality of Sickest PE Patients

| Treatment          | Overall (n=6) | Post-ECMO era (2011-2014) (n=258) | Pre-ECMO (1994-2008) (n=312) | p-value for ECMO/
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<tbody>
<tr>
<td>ECMO, n (%)</td>
<td>19 (31.7%)</td>
<td>13 (44.8%)</td>
<td>6 (3%)</td>
<td>&lt;0.001</td>
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<tr>
<td>Anticoagulation</td>
<td>30 (48.3%)</td>
<td>13 (44.8%)</td>
<td>15 (48.4%)</td>
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<td>Thirty-day survival</td>
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<td>17.2% vs 41.4% (p=0.042)</td>
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Case

- 50 year old man presents with CP and SOB after flying non-stop to Boston from India
- He is found to have bilateral proximal PE. RV dilatation
- In the ED, he is sitting in bed, requiring supplemental oxygen
- Vitals (ED): RR-24/min, HR-120 bpm, BP-100/60 mmHg
- Bedside TTE: Dilated and hypokinetic RV with preserved apex. Estimated PA pressure 50 mmHg.

Case Cont’d – He is found to have:

The Higher the PE-Related Risk, the Easier to Administer Lytics
Which of these would you choose for this Patient?

A. Anticoagulation with UFH (in anticipation for a procedure)
B. Anticoagulation with LMWH
C. Anticoagulation with a DOAC
D. IV half-dose lytics
E. IV full-dose lytics
F. Catheter directed lytics
G. IVC filter

Markers of PE-Related Mortality are Known

But Predicting / Preventing Decompensation is Harder

PEITHO; IV Lysis in Submassive PE: Advantage driven by reduced hemodynamic collapse

More bleeding with IV thrombolysis
ULTIMA: Quicker Resolution of RV Dysfunction: Indirect Evidence of Efficacy

Circulation. 2014 Jan 28;129(4):479-86

ULTIMA: Complications

- No major bleeding
- 4 minor bleeding:
  - 3 patients in the USAT group (10%): Transient hemoptysis, access site groin hematoma
  - 1 patient in the heparin group (3%): Muscular hematoma

Circulation. 2014 Jan 28;129(4):479-86

SEATTLE II: Single Arm CDT for Submassive PE: Positive Effect on Surrogate Markers. More Bleeds


OPTALYSE PE: Can Less Lytic be Effective?


OPTALYSE PE: Less Lytic Effective (on Surrogate Markers). But ICH Possible


Meta-Analysis: Mortality Benefit for Lytics in Sub-Massive PE. Know the #'s

JAMA. 2014 Jun 18;311(23):2414-21
And in the Right Patients Advanced Therapy may Result in Benefit

But How do we Choose to Implement Advanced Therapies and which ones?

Is PERT the Solution?

Modern PE Care Results in Increased Resource Utilization

...but Less Convincing Outcome Improvement

Let’s Try and Implement...
Is Mr. Anderson a Hemodynamically Unstable Patient?

- 64 years old
- 3 days of progressive shortness of breath
- Morning of admission chest pain and “hunger for air”
- In the ED:
  - HR 110 at rest
  - O2 Sat 92% on NC
  - BP 100/60
- PMHx: Hypertension
- Home medications: Lisinopril, HCTZ and ASA

Is Ms. Anderson Hemodynamically Unstable?

- 64 years old
- Previously healthy
- While walking off a plane collapsed
- Eye witnesses note spontaneous recovery within 1 minute
- Now in the ED:
  - HR 110 at rest
  - O2 Sat 99% on RA
  - BP 100/60
- Normal echocardiogram
- CT PE – Saddle PE

Is Mr. Anderson Unstable? – Cont’d

- Echocardiogram –
  - Dilated RV
  - Mild RV dysfunction
  - PA pressure estimated at 50 mmHg
- CT PE – Multiple segmental PE

Should Mr. Neo Receive an IVC filter?

- 64 years old
- Presented with chest pain and shortness of breath
- Currently in the ED:
  - HR 110 at rest
  - O2 Sat 92% on NC
  - BP 80/50
- Bilateral main PA PE
- Planned for catheter directed lysis

Should Ms. Trinity Receive an IVC filter?

- 64 years old
- Presented with chest pain and shortness of breath
- Currently in the ED:
  - HR 110 at rest
  - O2 Sat 92% on NC
  - BP 80/50
- Bilateral main PA PE
- Planned for IV lysis

Should Mr. Morpheus Receive IV Lysis or CDT?

- 64 years old
- Presented with chest pain and shortness of breath
- Currently in the ED:
  - HR 110 at rest
  - O2 Sat 89% on NC
  - BP 70/40
- Bilateral main PA PE
Can ECMO Help Mr. Jones?

- 64 years old
- Presented with chest pain and shortness of breath
- Collapsed in the ED
- Cannot receive IV Lysis because has known brain AVM
- Vital signs:
  - HR 110 at rest
  - O2 Sat 87% on NC
  - BP 60/
- Bilateral main PA PE
- Planned rescue surgical embolectomy

Take Home Messages

- Pulmonary emboli are heterogeneous
- Prognosis is determined by hemodynamic presentation
- Massive PE mandate aggressive and rapid treatment
- In submassive PE, little data suggest that aggressive treatment changes long-term outcomes
- For many patients with submassive PE an approach of watchful waiting (in an ICU) is reasonable and safe
- Aggressive treatment in submassive PE should be used judiciously, likely for patients who fail conservative therapy


@Angiologist