

Management of Pulmonary Embolism in the ICU

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Case

- 32 year old women presents with sudden onset chest pain and SOB.
- 7 weeks post partum: C-section
- Vitals:
 - p-140, BP 70/50, T-37, r-26, 92% 4 lpm
 - Moderate respiratory distress
 - Tachy, Loud P2, II/VI SEM
 - CT PE study: Large saddle PE (rpa)
 - Echo: Mod RV dilatation/hypokinesis RVSP 45 mmHg
 - BNP-210, TNi- 2.4

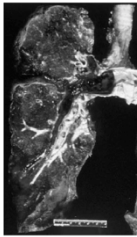
Case

- IVF bolus and norepinephrine (1 ug/kg/min) is started. The patient's BP improves to 90/60 mmHg and she remains tachycardic (130 BPM). She has been started on UF-heparin
- At this point you should
 - a) Continue heparin and watch her closely
 - b) Start front loaded TPA (10 mg over 10 minutes, then 90 mg over 2 hours)
 - c) Place an IVC filter.
 - d) Consult CV surgery for surgical embolectomy.

Outline

- Thrombolysis
- IVC Filters
- Emboelctomy

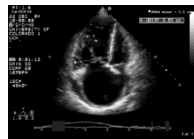
Pulmonary Embolism



Goldhaber, S.
NEJM;339 1998

PE and the Right Ventricle

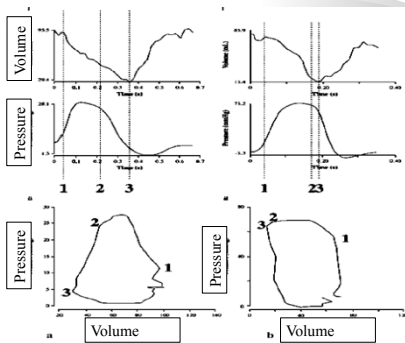
- Pulmonary Embolism: As goes your RV, so go you.
- Assessment of the RV is useful in prognostication
 - Echo
 - BNP
 - Troponin



Echocardiography in P.E.:

- Role as prognostic indicator:
 - Goldhaber SZ. Circulation 1997; 96: RV hypokinesis was associated with a doubling in mortality at 14 days.
 - Ribeiro A. Am Heart J 1997; 134: RV hypokinesis was associated with tripling of mortality at 1 year.
 - Kasper W. Pulmonary Embolism Registry (MAPPET). Heart 1997; 30: 1001 patients with P.E. and RV dysfunction. Increased mortality with worsening RV function.

RV: pressure, time, volume



Clinical Indicators of Outcome

- Hypotension:
 - Best indicator of mortality.
 - All cause 3 month mortality is 58% if SBP < 90 vs. 15% in normal SBP
- RV dysfunction: Echo, BNP, Tni
- PESI score: (PE severity Index)

Thrombolytics

- **Efficacy:**

- UPET- 1970, 160 patients with PE, UK vs. Heparin. Improved hemodynamics and VQ at 24 hours. No difference between groups at 5 days.
- 8 other similar trials using various agents (SK, rt-PA) with same findings.
- Jerjes-Sanchez et al- 1995
8 patients with shock due to PE
4 who received SK lived, 4 who received heparin died.
Trial stopped early

Thrombolytics and RV dysfunction

- **RV dysfunction: known marker mortality in PE**
- **Target this population**
 - RV dysfunction
 - Pulmonary Hypertension

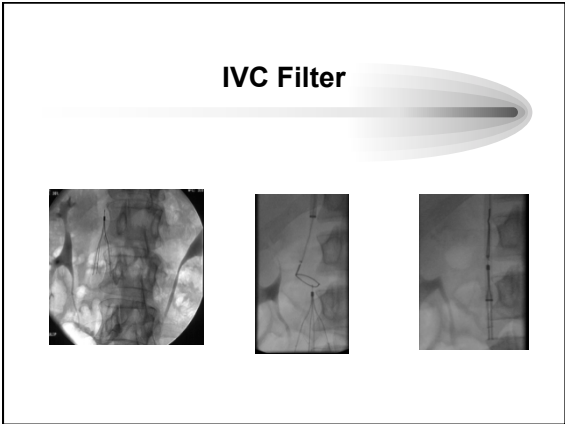
Thrombolytic Therapy in Hemodynamically Stable P.E.:

HEPARIN PLUS ALTEPLASE COMPARED WITH HEPARIN ALONE IN PATIENTS WITH SUBMASSIVE PULMONARY EMBOLISM

STAVROS KONSTANTINIDES, M.D., ANNETTE GEIBEL, M.D., GERHARD HEUSEL, Ph.D., FRITZ HEINRICH, M.D., AND WOLFGANG KASPER, M.D., FOR THE MANAGEMENT STRATEGIES AND PROGNOSIS OF PULMONARY EMBOLISM-3 TRIAL INVESTIGATORS*

Multi center RCT n=256 patients
Primary endpoint: 1) In hospital therapy
2) Escalation of therapy

Konstantinides et al NEJM 2002



IVC filters

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A CLINICAL TRIAL OF VENA CAVAL FILTERS IN THE PREVENTION OF PULMONARY EMBOLISM IN PATIENTS WITH PROXIMAL DEEP-VEIN THROMBOSIS

400 patients randomized to filter or no filter (also LMWH)
 Primary outcome: VTE recurrence at day 12 and at 2 years
 Day 12: 1.1% vs. 4.8% recurrent PE
 2 years: 20.8% vs. 11.6% DVT

No difference in mortality or bleeding at either time point

IVC Filter

Eight-Year Follow-Up of Patients With Permanent Vena Cava Filters in the Prevention of Pulmonary Embolism
 The PREPIC (Prévention du Risque d'Embolie Pulmonaire par Interruption Cave) Randomized Study
 The PREPIC Study Group*

396/400 patients followed over 8 years
 PE in 6.2% (filter) vs. 15.1% (non-filter) p=0.008
 DVT in 35.7% (filter) vs. 27% (non-filter) p=0.04
 Postthrombotic syndrome 70% vs. 69%
 At 8 years 50% of patients had died in both groups

IVC Filter

1. Failure of adequate anticoagulation
 2. Contraindication of anticoagulation
 3. The next one will KILL you (pulmonary hypertension)
- IVC filter does not decrease two year risk of PE
 - May decrease 8 year risk of PE
 - Associated with increase in DVT for those with initial PE
 - **Not controlled for use of anticoagulation

Surgical Embolectomy

- A paucity of clinical trials
- Selection bias
- Previously only considered as option of last resort.



Role of embolectomy

- Show the trend in mortality improvement
- 1968-1989: 35%
- 1990-1999: 30%
- 2000-2008: 19.1%
- 6% mortality reported by some groups
- No definitive study showing thrombolysis improves survival
- Some advocate surgical intervention in less critically ill patients.

Surgical Embolectomy

- Indications:
 - Sub massive to Massive PE with RV dysfunction.
 - Contraindication to thrombolysis
 - Failure of thrombolysis
 - PFO or ASD with right to left shunting
 - RA or RV clot (thrombolysis an option here)

Conclusions

- Thrombolysis
 - cardiogenic shock
 - RV dysfunction?
- IVC filter
 - Lack adequate studies for most clinical scenarios
 - Contraindication of anticoagulation
 - failure of anticoagulation
 - the next one is fatal
- Surgical Embolectomy
 - Mortality improving
 - ? Consider it earlier (???)

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