CATHETER-DIRECTED THERAPIES FOR ACUTE PE

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DISCLOSURES

• None

OBJECTIVES:

• Discuss incidence and possible theories for rising incidence
• Discuss Morbidity and Mortality of PE in the US
• Discuss the entity of “Post-PE Syndrome”
• Review European classification system and its contrast to US classification
• Treatment approach based on European Classification System
• Describe intravascular lytic therapy – risks and benefits
• Describe intravascular mechanical extraction, risks and patient candidacy

THE GREY AREA OF SUBMASSIVE PE

Submassive PE
PE with “RV strain”
Fatal PE

INR AVASCULAR LYTIC THERAPY

Antithrombotic Therapy for VTE Disease: CHEST Guideline and Expert Panel Report
February 2016
Guidance Statement
In patients with acute PE associated with hypotension (eg, systolic BP <90 mm Hg) who do not have a high bleeding risk, we suggest systematically administered thrombolytic therapy over no such therapy (Grade 2B).
In selected patients with acute PE who deteriorate after starting anticoagulant therapy but have yet to develop hypotension and who have a low bleeding risk, we suggest systematically administered thrombolytic therapy over no such therapy (Grade 2C).
Guidance Statement
The goals of thrombolytic therapy are to reduce thrombus burden and (a) for massive and submassive PE, to reduce mortality and recurrent PE, relieve symptoms, prevent CTEPH, preserve functional capacity, and improve quality of life.

What are the risks with thrombolytic therapy??
In previous studies, increasing age and the presence of coexisting conditions have been associated with a higher risk of bleeding complications.

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**BENEFITS OF SYSTEMIC THROMBOLYTIC THERAPY? RISKS?**

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**Thrombolysis for Pulmonary Embolism and Risk of All-Cause Mortality, Major Bleeding, and Intracranial Hemorrhage A Meta-analysis**

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**Table 1: Guidance Statement**

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**Table 2: Guidelines for the Treatment of Pulmonary Embolism**

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**Table 3: Characteristics of the Guidelines**

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**Figure 1: Flowchart of the Literature Search**

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**Figure 2: Flowchart of the Literature Search**

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**Figure 3: Flowchart of the Literature Search**

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**Figure 4: Flowchart of the Literature Search**

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**Figure 5: Flowchart of the Literature Search**
MECHANICAL THROMBECTOMY

- Approximately 8% of patients with MPE fail to thrombolytic therapy.
- Approximately 33% of the patients with MPE have absolute contraindications for thrombolysis.
- Mortality in the first 7 days when presenting in shock is estimated between 25 to 50%.
- Overall 3 months mortality was 17.4%.
- "Golden hour" of treating hemodynamically significant PE.

OPTIONS FOR THROMBECTOMY

- Surgical pulmonary embolotomy (SPE) vs catheter-directed thrombolysis (CDT)
- Catheter guided can be diagnostic and therapeutic (i.e. severe hemodynamic instability in whom empiric anticoagulation is contraindicated)
- Surgical embolotomy
- Thrombolysis (systemic or catheter-directed) is contraindicated or has failed
- Echocardiographic evidence of an embolus trapped within a patent foramen ovale, or present in the right atrium, or right ventricle
- Decision regarding which option to pursue is guided by available expertise, whether PE is known to exist and anticipated response to therapies.

CATHETER-DIRECTED THROMBOLYSIS

Guidance Statement

In patients with acute PE who are treated with a thrombolytic agent, we suggest systemic thrombolytic therapy using a peripheral vein over CDT (Grade 2C).

In patients with acute PE associated with hypotension and who have (i) a high bleeding risk, (ii) failed systemic thrombolysis, or (iii) shock that is likely to cause death before systemic thrombolysis can take effect (eg, within hours), if appropriate expertise and resources are available, we suggest catheter-assisted thrombus removal over no such intervention (Grade 2C).
Catheter-directed thrombolysis
- Ultrasound-assisted thrombolysis/pharmacomechanical thrombolysis
- Suction embolectomy
- Thrombectomy fragment
- Rotational embolectomy
- Rheolytic embolectomy

Ultrasound-assisted thrombolysis
- ULTIMA
  - 1/35 included for inclusion PE
  - Compared ultrasound-assisted thrombolysis with anticoagulation alone (10 mg of intravenous enoxaparin per day for 6 days) to anticoagulation alone (10 mg of intravenous enoxaparin per day for 6 days)
  - ULMIA resulted in an improved RV/LV ratio (mean difference 0.3 versus 0.05), suggested a hemodynamic benefit. At 28 days, there was no difference in duration on major bleeding between the groups

Seattle II
- Prospective, register, multi-center trial designed to evaluate the safety and effectiveness of ultrasound-assisted catheter-directed thrombolysis for the treatment of acute massive PE
- One hundred thirty patients diagnosed as acute massive PE were randomized to receive ultrasound-assisted thrombolysis or anticoagulation alone
- All 130 patients with acute PE survived the 30-day follow-up period. No intracranial hemorrhages were observed. No deaths were noted during the follow-up period

Rheolytic embolectomy
- AngioJet thrombectomy

33 patients with acute PE and contraindications to thrombolytic therapy were treated with AngioJet at a single tertiary referral center (Rome, Italy). 9 intraprocedural echocardiographic improvement in 22/23 patients, with a rapid amelioration in functional class and an increase in oxygen saturation.

Immediate and midterm benefits of SPE
- Retrospective review of patients who underwent surgical pulmonary embolectomy for acute pulmonary embolism was conducted from 1998 to 2014 at a US academic center
- 44 patients were included for analysis: 35 patients (79.5%) had a submassive pulmonary embolism, and 9 patients (20.5%) had a massive pulmonary embolus.
- 1 in-hospital mortality (2.3%), and there were no permanent neurologic deficits
- 21 patients had perioperative echocardiographic data which showed an immediate decrease in TR velocity and right ventricular pressure (P < 0.05)
- Echocardiographic follow-up in 12 patients (mean follow up at 30 months)
  - Only 1 patient had moderate right ventricular dysfunction
  - No patient had worse than mild tricuspid regurgitation

Other options
- Rotational embolectomy: Aspircx catheter
- Suction embolectomy
- AngioJet system
- FlowTriever Retrieval/Aspiration System ("FlowTriever System")
- PLARE study is a prospective, multicenter, single-arm study evaluating the FlowTriever in 150 patients with acute pulmonary embolism.
SPE MORTALITY

- 2007: Stein et al.1 reported on 46 case series of patients operated from 1961 to 2006
  - Operated on or before 1985: average mortality was 32%
  - Operated from 1985 to 2005: average mortality was 20%
  - Operative mortality was 59% in patients who experienced cardiac arrest before pulmonary embolectomy compared with 29% in patients who did not have preoperative cardiac arrest
- 2017: Kalra et al.2 reviewed 56 eligible studies
  - 1,579 patients who underwent 1,990 SPE operations
  - Pooled inhospital all-cause mortality rate was 26.3% (95% confidence interval: 22.9% to 30.5%)

43 Y F presents to the ED with severe dyspnea. She tells the ED physician that she smokes, uses OCPs and recently drove to Denver to enjoy a last minute ski trip. In the ED she was found to have O2 sats in the mid-80s, HR 110 (sinus tachycardia) and her BP was 120s/60s. A CT PE protocol showed large clots in both main pulmonary artery divisions. Labs are pending, including troponin and BNP. She is placed on nasal cannula O2 at 6 L/min and plans are made to admit her to the ICU. A TTE is ordered but has not been completed. The ED physician calls you- the intensivist on call- to decide whether thrombolytics or thrombectomy should be considered instead of anticoagulant therapy alone. What is the best response to give the ED physician regarding treatment options? IR and CT surgery are on call and available for advanced therapeutics.

- A) Admit to the ICU after starting heparin therapy
- B) Give alteplase STAT and admit to the ICU for continued monitoring
- C) Wait for more diagnostic testing including TTE, troponin
- D) Consult IR for U/S assisted thrombolysis
- E) Consult CT surgery for surgical embolectomy