Impact of a comprehensive multidisciplinary pulmonary embolism response team in the care of patients presenting with high-risk pulmonary embolism at a quaternary referral center

Providence SWEDISH

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Background

High-risk pulmonary embolism (HRPE) represents the most critical cohort of patients presenting with venous thromboembolism and is the major determinant of death. The current therapeutic strategy is emergent reperfusion. We describe the outcomes and therapeutic strategies utilized in patients presenting with HRPE utilizing a comprehensive multidisciplinary pulmonary embolism response team (PERT) approach in a regional referral center.

Methods

Study Design & Duration:

- Single-center retrospective analysis
- January 2012 to December 2023

Population:

- All patients with HRPE:
  - Hypotension SBP < 90 mm Hg at presentation
  - Need for inotropes or vasopressors
  - Lactic acidosis > 2 mmol/L
  - Catastrophic PE: Cardio-respiratory arrest

Therapeutic Regimen Grouping:

- Anticoagulation alone (AC)
- Systemic thrombolysis (ST)
- Catheter directed thrombolysis (CDT)
- Percutaneous mechanical thrombectomy (PMT)
- Surgical embolectomy (SE)
- ECMO

Results

Patient Classification & Mortality:

- 11% (67/604) of PERT activated patients were HRPE
- 3% (19/604) presented with cardiac arrest (CPE)
- Hospital mortality for all HRPE patients was 18%
- Survival of CPE was 74%
- AC: 28%
- Systemic tPA 33% - Mortality 11%
  - 1 patient required rescue (PMT)
- SE: 20% - Mortality 18%
  - 3 patients underwent SE after CPE and all survived to discharge
- ECLS: 3 patients
- PMT: 12% - Mortality 30%
  - Treatment failure 20%
- CDT: 8% - Mortality 14%
  - Treatment failure 43%

Table 1: Outcomes Among HRPE Patients by First Treatment

Outcome	Overall, N = 67[1]	Anticoag Only, N = 19[1]	Systemic tPA, N = 20[1]	Cath tPA, N = 6[1]	Cath Thrombectomy, N = 8[1]	Surg Embolectomy, N = 14[1]
Treatment Failure	6 (9.0%)	N/A	1 (5.0%)	3 (50%)	2 (25%)	N/A
Significant Bleed	9 (13%)	0 (0%)	2 (10%)	1 (17%)	1 (13%)	5 (36%)
Hemorrhagic Stroke	1 (1.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (7.1%)
Acute Kidney Injury	21 (31%)	6 (32%)	6 (30%)	0 (0%)	2 (25%)	7 (50%)
ECMO	3 (4.5%)	0 (0%)	1 (5.0%)	0 (0%)	0 (0%)	2 (14%)
Mortality	12 (18%)	4 (21%)	2 (10%)	1 (17%)	2 (25%)	3 (21%)
ICU LOS	3.0 (1.3, 5.6)	2.3 (1.3, 3.3)	2.2 (1.3, 4.0)	2.5 (1.0, 4.8)	0.9 (0.7, 3.2)	7.7 (3.9, 13.4)
Total Hospital LOS	8 (4, 16)	6 (4, 12)	8 (5, 9)	5 (3, 9)	9 (3, 16)	16 (8, 22)

[1] n (%): Median (IQR)

1 PERT case died before receiving any treatment and is therefore excluded from this summary

Significant Bleed includes Hemorrhagic Stroke

Table 2: Outcomes Among CPE Patients by First Treatment

Outcome	Overall, N = 19[1]	Anticoag Only, N = 5[1]	Systemic tPA, N = 8[1]	Cath tPA, N = 1[1]	Cath Thrombectomy, N = 2[1]	Surg Embolectomy, N = 3[1]
Treatment Failure	1 (5.3%)	N/A	1 (13%)	0 (0%)	0 (0%)	N/A
Significant Bleed	4 (21%)	1 (20%)	2 (25%)	0 (0%)	0 (0%)	1 (33%)
Hemorrhagic Stroke	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Acute Kidney Injury	7 (37%)	1 (20%)	2 (25%)	0 (0%)	1 (50%)	3 (100%)
ECMO	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Mortality	5 (26%)	3 (60%)	1 (13%)	0 (0%)	1 (50%)	0 (0%)
ICU LOS	3 (1, 15)	1 (1, 2)	3 (2,9))	19 (19, 19)	17 (17, 17)	6 (4, 11)
Total Hospital LOS	8 (3, 22)	3 (2, 4)	8 (3, 25)	19 (19, 19)	17 (9, 24)	16 (15, 23)

[1] n (%): Median (IQR)

1 PERT case died before receiving any treatment and is therefore excluded from this summary

Significant Bleed includes Hemorrhagic Stroke

Conclusion

Quaternary centers with a spectrum of reperfusion therapies including the capability to perform surgical embolectomy and ECLS may improve outcomes of patients with high- risk pulmonary embolism including those presenting with cardiopulmonary arrest. A well-coordinated multidisciplinary PERT team is essential for directing and coordinating reperfusion therapies and actions following initial treatment failures.

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