

Use and clinical outcome of veno-arterial extracorporeal membrane oxygenation in patients with acute pulmonary embolism and cardiopulmonary resuscitation

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Background: Extracorporeal membrane oxygenation (ECMO) is a life-saving therapy for patients with acute pulmonary embolism (PE) and concomitant cardiac arrest with the necessity of cardiopulmonary resuscitation (CPR). Little is known about the use and clinical outcome of veno-arterial (VA)-ECMO and adjunctive treatment strategies in patients with acute PE and CPR.

Purpose: In this context, we aimed to investigate the use of VA-ECMO alone or after systemic thrombolysis and its impact on in-hospital outcomes of patients with acute PE and CPR.

Methods: We analyzed data on the characteristics, treatments and in-hospital outcomes for all patients with acute PE (ICD-code I26) and CPR in Germany between the years 2005 and 2018 (source: Research Data Center (RDC) of the Federal Statistical Office and the Statistical Offices of the federal states, DRG Statistics 2005-2018, own calculations).

Results: Between 2005 and 2018, 1,172,354 patients with acute PE (53.5% females) were included in this analysis; of those, 77,196 (6.5%) presented with cardiac arrest and CPR.

While more than one fourth of those patients were treated with systemic thrombolysis alone (n = 20,839 patients; 27.0%), a minority received a combination of thrombolysis + VA-ECMO (n = 165; 0.2%) or singular approach with VA-ECMO treatment alone (n = 588; 0.8%). The overall in-hospital mortality rate of PE patients with cardiac arrest was high with 83.8%. Non-survivors were considerable older than survivors (74 [IQR 63-81] vs. 69 [58-77]). In patients treated with VA ECMO alone the mortality rate was 71.1% and 69.7% when patients received Thrombolysis + VA-ECMO. Patients, who received thrombolysis without VA-ECMO had a higher mortality rate (83.8%).

In order to investigate the impact of those different treatment strategies, a multivariate logistic regression analysis (adjusted for age, sex and comorbidities) demonstrated the lowest risk for in-hospital death in patients, who underwent the combination of Thrombolysis + VA-ECMO (OR, 0.61 [95% CI, 0.43-0.86], P = 0.004) or VA-ECMO alone (OR, 0.70 [0.58-0.84], P < 0.001) compared to patients without VA-ECMO and without thrombolysis. Use of thrombolysis alone in patients with PE and CPR lowering the risk regarding in-hospital death as well (OR, 0.95 [0.91-0.99], P = 0.013). Regarding temporal trends, the annual use of VA-ECMO increased from 0 in the year 2005 to the number of 138 in 2018 (β 6.13 (4.62-6.76); p < 0.001) as well as for the combined treatment Thrombolysis + VA-ECMO (from 0 to 39 [β 4.28 (3.68-4.89); p < 0.001]).

Conclusion: Patients with acute PE and CPR had a very high in-hospital mortality rate. Our data suggest, that VA-ECMO alone or after systemic thrombolysis should be considered as an option in this outstanding life-threatening situation to improve in-hospital outcome. Furthermore, our data highlight a marked increase in the number of PE patients treated with VA-ECMO indicating the structural health care progress between 2005 and 2018.