Acute infections and inflammatory biomarkers in patients with acute pulmonary embolism

A. Eggers¹, A. Hafian², M. Lerchbäumer³, G. Hasenfus², M. Lankeit², M. Ebner⁴

¹German Heart Center Berlin, Department of Cardiology, Angiology and Intensive Care Medicine, Charité Campus Virchow-Klinikum, Berlin, Germany
²University Medical Center of Gottingen (UMG), Clinic of Cardiology and Pneumology, Goettingen, Germany
³Charite - Campus Mitte (CCM), Department of Radiology, Berlin, Germany
⁴German Heart Center Berlin, Department of Cardiology, Angiology and Intensive Care Medicine, Charité Campus Mitte, Berlin, Germany

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Background: Although pneumonia is considered a common complication of acute pulmonary embolism (PE), the true incidence of infections after PE and the effect of infections on patient outcome are insufficiently studied.

Purpose: To investigate incidence and prognostic impact of acute infections and inflammatory biomarkers in patients with acute PE.

Methods: Consecutive PE patients enrolled in a prospective single-centre registry between 09/2008 and 02/2019 were studied. We excluded patients with (1) missing C-reactive protein (CRP) measurements at the time of PE diagnosis, (2) cardiopulmonary resuscitation as the presenting symptom, and (3) other acute cardiopulmonary or infectious disease responsible for the clinical presentation. We evaluated the incidence and impact of infections requiring antibiotic treatment and of inflammatory biomarkers (CRP and procalcitonin [PCT]) on the primary study outcome (hemodynamic insufficiency or in-hospital all-cause death) and the duration of the in-hospital stay.

Results: We analysed data from 749 patients (age 69 [interquartile range (IQR) 56-78] years). The primary study outcome occurred in 65 (8.7%) patients. Of 26 (3.4%) patients who died during the in-hospital stay, 17 (65.4%) deaths were due to PE and 6 (23.1%) due to infections. During the first 7 days after PE 347 (46.3%) patients required antibiotic treatment; in 79.6% due to pneumonia (Figure). On multivariate logistic regression analyses, antibiotic treatment increased the risk for the primary outcome with an OR of 3.12 (95% confidence interval [CI] 1.70-5.74), similar to an increase in one risk class of the ESC 2019 risk stratiﬁcation algorithm (OR 3.45 [95% CI 2.24-5.30]). Furthermore, patients requiring antibiotic treatment had a longer duration of in-hospital stay compared to patients with no antibiotic treatment (11.0 vs. 7.0 days, p<0.001).

At presentation, the majority of patients (86.4%) had CRP elevations above the upper limit of normal (median 33.5 [IQR 11.4-71.2] mg/l) and 34.2% had elevated PCT levels (median 0.05 [IQR 0.03-0.10] µg/l). CRP >124 mg/l and PCT >0.25 µg/l predicted the main study outcome with >90% specificity and odds ratios (OR) of 4.64 (95% CI 2.52-8.21) and 6.88 (95% CI 3.48-13.59), respectively. Furthermore, the predictive value associated with elevated inflammatory markers was independent of established risk factors for early mortality such as elevated troponin and the simplified Pulmonary Embolism Severity Index (sPESI).

Conclusion: Clinically relevant infections requiring antibiotic treatment occurred in almost half of patients with acute PE and carried a similar prognostic effect as an increase in one risk class of the ESC 2019 risk stratiﬁcation algorithm. Furthermore, elevated levels of CRP and PCT were independent predictors of adverse outcome.

Indications for antibiotic treatment