



UKE Paper of the Month Mai 2020

Autopsy Findings and Venous Thromboembolism in Patients With COVID-19

Dominic Wichmann*; Jan-Peter Sperhake*; Marc Lütgehetmann; Stefan Steurer; Carolin Edler; Axel Heinemann; Fabian Heinrich; Herbert Mushumba; Inga Kniep; Ann Sophie Schröder; Christoph Burdelski; Geraldine de Heer; Axel Nierhaus; Daniel Frings; Susanne Pfefferle; Heinrich Becker; Hanns Bredereke-Wiedling; Andreas de Weerth; Hans-Richard Paschen; Sara Sheikhzadeh-Eggers; Axel Stang; Stefan Schmiedel; Carsten Bokemeyer; Marylyn M. Addo; Martin Aepfelbacher; Klaus Püschelt†; Stefan Kluge†

* shared first authorship

† shared last authorship

[Annals of Internal Medicine; 2020; doi: 10.7326/M20-2003 online ahead of print](#)

ABSTRACT:

Background: The new coronavirus, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), has caused more than 210 000 deaths worldwide. However, little is known about the causes of death and the virus's pathologic features.

Objective: To validate and compare clinical findings with data from medical autopsy, virtual autopsy, and virologic tests.

Design: Prospective cohort study.

Setting: Autopsies performed at a single academic medical center, as mandated by the German federal state of Hamburg for patients dying with a polymerase chain reaction–confirmed diagnosis of COVID-19.

Patients: The first 12 consecutive COVID-19–positive deaths.

Measurements: Complete autopsy, including postmortem computed tomography and histopathologic and virologic analysis, was performed. Clinical data and medical course were evaluated.

Results: Median patient age was 73 years (range, 52 to 87 years), 75% of patients were male, and death occurred in the hospital ($n = 10$) or outpatient sector ($n = 2$). Coronary heart disease and asthma or chronic obstructive pulmonary disease were the most common comorbid conditions (50% and 25%, respectively). Autopsy revealed deep venous thrombosis in 7 of 12 patients (58%) in whom venous thromboembolism was not suspected before death; pulmonary embolism was the direct cause of death in 4 patients. Postmortem computed tomography revealed reticular infiltration of the lungs with severe bilateral, dense consolidation, whereas histomorphologically diffuse alveolar damage was seen in 8 patients. In all patients, SARS-CoV-2 RNA was detected in the lung at high concentrations; viremia in 6 of 10 and 5 of 12 patients demonstrated high viral RNA titers in the liver, kidney, or heart.

Limitation: Limited sample size.

Conclusion: The high incidence of thromboembolic events suggests an important role of COVID-19–induced coagulopathy. Further studies are needed to investigate the molecular mechanism and overall clinical incidence of COVID-19–related death, as well as possible therapeutic interventions to reduce it.

Primary Funding Source: University Medical Center Hamburg-Eppendorf.

STATEMENT:

Our paper is the result of a highly collaborative work of six UKE departments and institutes together with other health care providers in Hamburg. During the ongoing SARS-CoV-2 pandemic it is the first work describing detailed pathological findings in patients dying from COVID-19. The most surprising findings were coagulation abnormalities contributing to the death of one third of the patients.

It has gathered immediate media attention world-wide. So far mentioned by 2476 twitter users; 20 international news outlets, 5 blogs, 20 facebook pages and 2 reddits. After one month it has already been cited by 19 other scientific publications and reached “High Attention Score compared to outputs of the same age (99th percentile)” in Altmetrics.

BACKGROUND:

This work has been conducted in close collaboration of six UKE departments/institutes as well as other health care providers in Hamburg. PD Dr. Dominic Wichmann (Department of Intensive Care Medicine) and Prof. Dr. Jan Sperhake (Institute of Legal Medicine) share the first authorship. Both institutions lead by Prof. Dr. Püschel (Institute of Legal Medicine) and Prof. Dr. Kluge (Department of Intensive Care Medicine) look back on a history of successful collaboration in recent years. In addition, substantial contribution to this work came from the Institute of Medical Microbiology, Virology and Hygiene and the Institute of Pathology.