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# Are subpleural consolidations indicators for segmental pulmonary embolism in COVID-19?

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Dear Editor,

We congratulate Peng et al. [1] for their timely report on lung ultrasonography in COVID-19 patients. As reported earlier, pulmonary pathologies in the SARS-CoV-2-induced lung disease are detectable in early stages by computed tomography of the chest [2]. Using lung ultrasonography with the 12-zone method, Peng et al. could identify several characteristics common to all COVID-19 patients. The point-of-care ultrasound offers several major advantages over the computed tomography concerning patient safety, avoidance of radiation, resource management and prevention of potential virus spreading as discussed by the authors. From our observations, we can confirm that signs discussed by the authors are present in our COVID-19 patients.

The findings described, however, are not exclusive for COVID-19. Wet lungs are seen in pulmonary edema of multiple causes. Even more important, the small subpleural triangular consolidations described as typical signs for COVID-19 are well known and described sonographic criteria for peripheral or segmental pulmonary embolisms with high sensitivity and specificity (76.9% and 91.3%, respectively) [3]. Interestingly, elevated d-dimers are frequently detected in COVID-19 and are associated with adverse outcome [4], while the pathomechanism of the d-dimer elevation is not yet understood. As for SARS-CoV-1, there are in vitro data demonstrating induced hfg12 prothrombinase gene transcription, which promotes thrombosis. Reports on

empiric anticoagulation using heparin in patients with COVID-19 and elevated d-dimers suggest lower mortality [5], though pulmonary artery embolism was not investigated. Does COVID-19 mimic a peripheral or segmental pulmonary embolism or are subpleural triangular consolidations actually signs for pulmonary embolism?

In order to address this issue of immediate therapeutic relevance, we performed a bedside snapshot study and screened all SARS-CoV-2-positive patients on mechanical ventilation with elevated d-dimer levels for the presence of multiple subpleural consolidations. Three out of 10 patients met the inclusion criteria. Baseline characteristics were age 59–60 years, d-dimers >35.2 mg/l, pulmonary artery pressure estimated by transthoracic echocardiography 35–54 mmHg, no d-signs. None of the patients suffered from coagulopathy or clinical signs for thrombosis, and all were on prophylactic heparin therapy. Since likelihood for pulmonary embolism of these patients was considered medium to high, all patients underwent a chest contrasted computed tomography, which detected segmental pulmonary artery embolisms in all three patients.

Of course, we cannot rule out coincidental occurrence of pulmonary embolism. However, pulmonary artery embolism might be a specific complication of COVID-19. We believe that the incidence of pulmonary embolism in COVID-19 patients has to be further investigated. In patients with elevated d-dimers and subpleural consolidations in lung ultrasonography, further diagnostic workup of a potential pulmonary embolism might be advised. Therefore, lung ultrasonography proposed by Peng et al. might be an addition rather than a replacement for computed tomography.

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### Acknowledgements

Open Access funding provided by Projekt DEAL.

### Compliance with Ethical Standards

### Conflict of interest

The authors declare that there is no conflict of interest.

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Accepted: 6 April 2020

Published online: 23 April 2020

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