

## CT appearance of severe, laboratory-proven coronavirus disease 2019 (COVID-19) in a Caucasian patient in Berlin, Germany

### Introduction

Coronavirus disease 2019 (COVID-19) is a new lower respiratory tract illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), originating from Wuhan, Hubei Province, China, in December 2019 [1, 2]. Despite enormous efforts to limit its propagation, the virus has spread rapidly across various countries around the world. At the end of January 2020, the World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern. As of 8 March 2020, 105 586 infections and 3584 deaths have been recorded worldwide, the vast majority of cases being located in China [3]. While infection rates are slowing in China, numbers of new infections are still exponentially growing in many other countries, South Korea and Italy being the most severely affected [3].

Several publications have characterized CT-morphological changes of COVID-19 in Chinese patients [4–7]. To our knowledge, however, only one publication has shown CT images of two Caucasian patients examined in Western countries so far [8]. Here we present the case with CT imaging of a Caucasian patient with coronavirus disease 2019 (COVID-19) in Berlin, Germany.

### Case presentation

#### Clinical history

A 61-year old male Caucasian complained of shivers, fever up to 39 °C and general malaise. These symptoms continued during the three following days, and a dry cough occurred. Because of the clinical presentation and considering the patient's age and comorbidities (arterial hypertension and slightly impaired renal function), an elevated risk for COVID-19 was suspected and quantitative reverse transcription polymerase chain reaction (RT-PCR) for SARS-CoV-2 was performed. As it returned positive, the patient was admitted to our hospital and isolated.

On admission, the patient had a fever up to 39 °C, but no dyspnoea. Lung auscultation

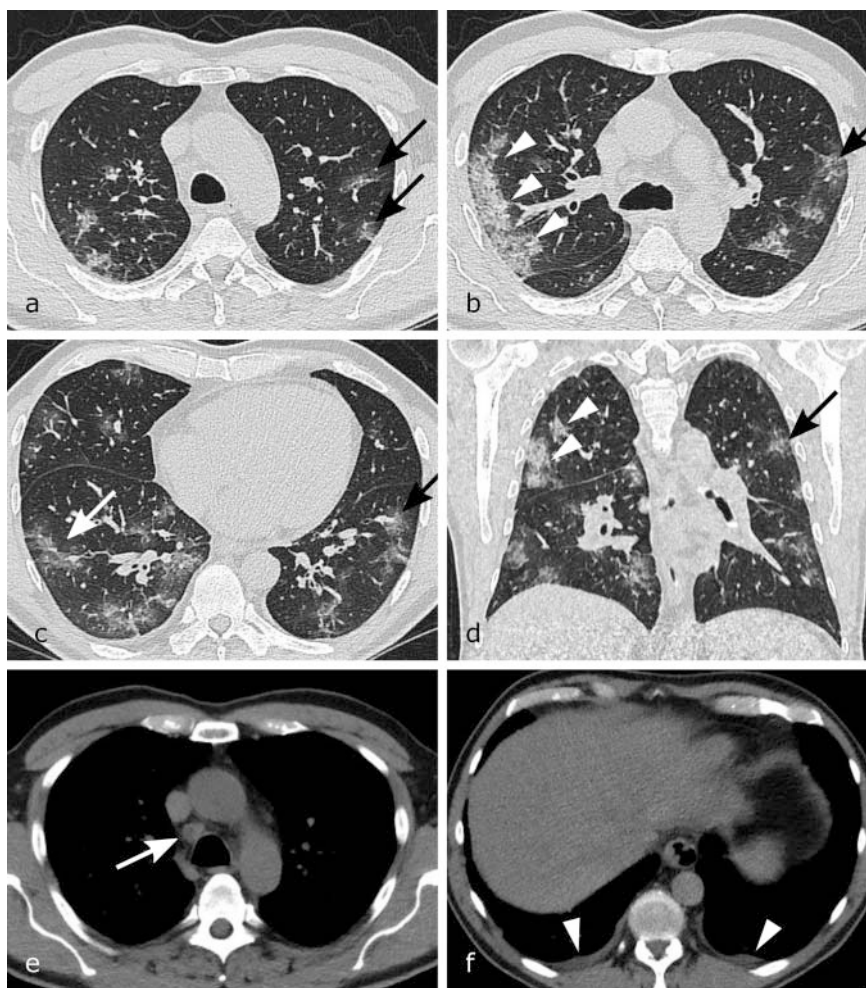
as well as respiratory rate (12–14/min) and peripheral capillary oxygen saturation were normal. Laboratory testing showed the typical constellation of a viral infection with normal leucocyte levels, lymphopenia (0.65/nl; normal range 1.10–4.50/nl), elevated C-reactive protein (CRP) levels (62.6 mg/l; normal range <5 mg/l) and a normal procalcitonin level (0.12 µg/l; normal range: <0.50 µg/l). Glomerular filtration rate was 53 ml/min. Coagulation status was normal. Testing for influenza virus was negative.

During the two following days, the clinical condition deteriorated: fever contin-

ued, and during nightly coughing attacks peripheral capillary oxygen saturation dropped repeatedly to 91 %. Daily auscultation revealed the development of localized areas with coarse inspiratory crackles. Creatinine levels dropped to normal under intravenous fluid substitution, but CRP levels rose to 86.9 mg/l. To better evaluate disease progression an unenhanced chest CT was performed.

#### Imaging findings

Unenhanced chest CT was performed using a 128-row multidetector CT with



► **Fig. 1** Chest CT of a male Caucasian patient with laboratory proven COVID-19 pneumonia. **a–d**, patchy ground glass opacities (GGOs, arrows) and areas of consolidation (arrowheads) bilaterally in all lung lobes, mostly in peripheral location, with a slight preponderance of dorsal lung areas and sparing of the lung apices. **e**, slightly enlarged mediastinal lymph nodes (arrow). **f**, small bilateral pleural effusions (arrowheads).

dose modulation and iterative reconstruction algorithm (iCT, Philips, Amsterdam, Netherlands). Tube voltage was set at 120 kV, tube current ranged between 50 and 69 mAs. Primary axial images were reconstructed in 1 mm slices with multiplanar reformations.

Images showed patchy ground glass opacities (GGOs), areas of consolidation and mixed appearances of GGOs and consolidation bilaterally in all lung lobes (► Fig. 1a–d). Some lesions had a band-like appearance (► Fig. 1b). Most lesions were located peripherally, with a slight preponderance of dorsal lung areas. Lung apices were spared (► Fig. 1d). Areas with crazy paving pattern were not detected. There were small bilateral pleural effusions and slightly enlarged mediastinal lymph nodes (► Fig. 1e, f). Tracheobronchial as well as cardiovascular structures appeared normal.

## Discussion

In this case report, we present CT images of a Caucasian patient with COVID-19 pneumonia obtained six days after onset of symptoms. Diagnosis of COVID-19 was confirmed by positive RT-PCR on day 4 after onset of symptoms.

To our knowledge, this is one of the first published imaging studies of COVID-19 outside of China. Imaging findings in our patient are perfectly in line with previous publications from China: Patchy or band-like GGOs, multifocal consolidations and areas with a combination of GGOs and consolidations have been described previously in Chinese COVID-19 patients [4–7]. Apart from these typical disease manifestations, our patient showed small bilateral pleural effusions and discreet mediastinal lymphadenopathy which have been found in only a small part of Chinese patients [4, 5, 7]. As the CT appearance of COVID-19 has been shown to correlate with clinical symptoms, imaging findings in our patient hint to a severe disease manifestation [9]. Maximum disease activity and CT findings are typically seen at day 10 after onset of symptoms [10].

In China, CT plays a major role in the early diagnosis of COVID-19 since its sensitivity was found to be higher compared to RT-PCR (97 % vs. 60 %) [11]. In Germany, however, RT-PCR is still the first-line early diagnostic tool, and imaging is reserved for severe cases or to rule out differential diagnoses. This is probably because the overall number of patients is much lower, RT-PCR kits are widely available, and laboratories claim to achieve higher sensitivity rates using optimized RT-PCR techniques, although there are no publications supporting this assumption yet.

## Conclusions

CT morphologic changes of COVID-19 in our Caucasian patient are very similar to previous findings in the Chinese population. CT may be a useful tool to evaluate the extent of the disease in severe cases, provide prognostic information and guide future treatment options.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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