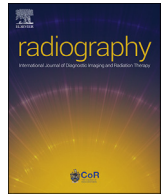




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## Case report

## A case series of chest imaging manifestation of COVID-19

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## ABSTRACT

Coronavirus disease 2019 (COVID-19) is caused by a infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).<sup>1</sup> It started in Wuhan, China, in December 2019, after which quickly spread to many other countries around the world. Chest radiography (CXR) and computed tomography (CT) play key roles in management and diagnosis of COVID-19. In this case series we are presenting three patients with predominant left-sided changes caused by COVID-19 infection.

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## Introduction

Radiology department staff along side with other health professionals play a key role in the diagnosis and management of COVID-19. For clinical confirmation of SARS-CoV-2 the conventional method in use is real-time reverse transcriptase–polymerase chain reaction (rRT-PCR) of nasopharyngeal swab.<sup>2</sup> However, sensitivity of rRT-PCR ranges between 70 and 90% on first swab<sup>3</sup> and 90% on a second swab after 72 h.<sup>4</sup>

The Clinical Center of the University of Sarajevo has adopted recommendations and worked to improve on them by installing a dedicated mobile chest radiography (CXR) unit and computed tomography (CT) scanner only for coronavirus patients. The CT protocol has been optimised for low dose and CTID<sub>vol</sub> for presented patients was 2.4 mGy.

While infection has become a global concern, it is equally important for radiology departments to be more familiar with the imaging appearance and techniques for better understanding of the COVID-19 infection.

In this case series we present three confirmed cases of COVID-19 infection from Sarajevo, Bosnia and Herzegovina.

## Case 1

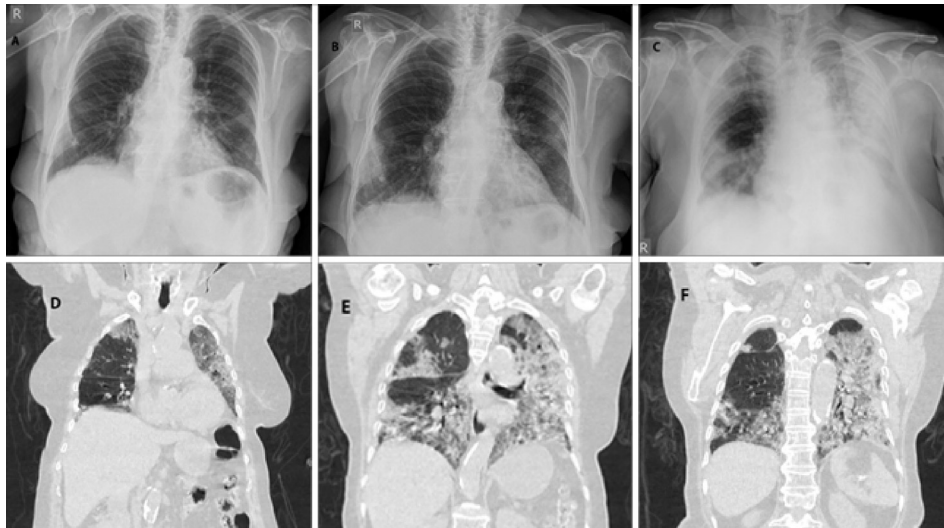
An 81-year-old female presented to the Clinical Center of the University of Sarajevo with morning and evening fever (temperature 38.1 °C). Nasopharyngeal swab (RT-PCR) showed a positive result for SARS-CoV-2. The patient had no history of being in contact with another confirmed COVID-19 patient in the family or traveling outside her hometown. Mobile CXR on April 8th, 2020 showed diffuse reticular and linear pattern of the lower lobes (Fig. 1A). Follow-up CXR obtained 3 days later (Fig. 1B) showed bilateral progression. Rapid progression occurred across 10 days (Fig. 1C) with bilateral, predominantly left sided consolidation and development of acute respiratory distress syndrome. Follow-up CT examination was obtained 14 days from presentation and demonstrates ground-glass opacities with crazy paving in the upper parts of both lobes (Fig. 1D) and significant pulmonary consolidation in the lower lobes (Fig. 2E and F) predominantly on the left side. The total severity score (TSS) was 19.

## Case 2

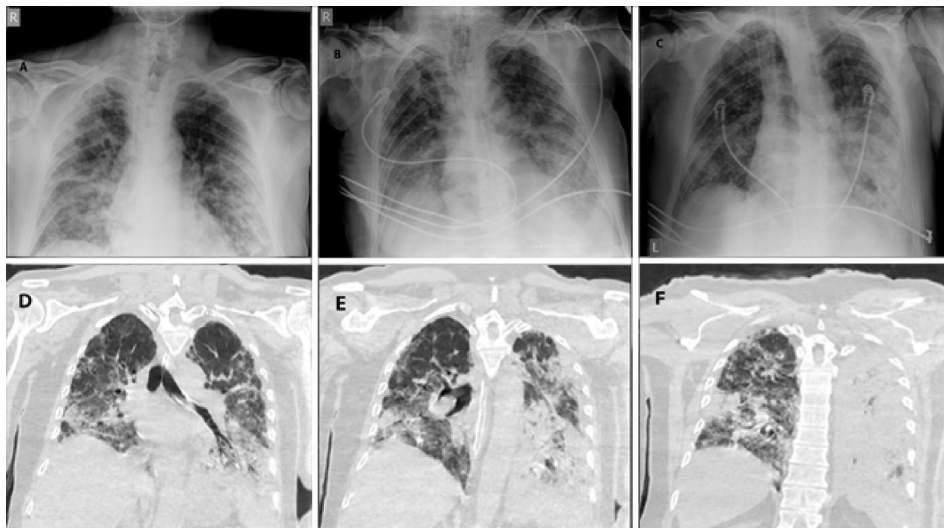
A 61-year-old male presented with cough and fever after recent travel to Austria and being in contact with a COVID-19 positive patient. Nasopharyngeal swab (RT-PCR) showed a positive result for SARS-CoV-2. Mobile CXR on April 2nd, 2020 demonstrated diffuse reticular pattern (Fig. 2A). Follow-up mobile CXR obtained

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**Figure 1.** A Mobile chest radiograph (day 0) showing diffuse reticular and linear pattern of the lower lobes. B Repeat mobile chest radiograph (day 3) showing bilateral progression. C Repeat mobile chest radiograph (day 10) showing rapid progression occurred with bilateral, predominantly left sided consolidation. D Coronal CT reconstruction (day 14) demonstrates ground-glass opacities with crazy paving in the upper lobes. E Coronal CT reconstruction (day 14) demonstrates significant pulmonary consolidation in the lower lobes. F Coronal CT reconstruction (day 14) demonstrates significant pulmonary consolidation in the lower lobes.



**Figure 2.** A Mobile chest radiograph (day 0) demonstrates diffuse reticular pattern. B Repeat mobile chest radiograph (day 5) showed mild regression of bilateral consolidations. C Rapid bilateral progression by day 11, more pronounced on the left side, and with complete lower lobe consolidation. D Coronal CT reconstruction obtained on day 13 showing pulmonary consolidation in the lower lobes. E Coronal CT reconstruction showing pulmonary consolidation and ground-glass opacities with crazy paving. F Coronal CT reconstruction showing pulmonary consolidation and ground-glass opacities with crazy paving predominantly on the left posterior side.

on April 7th, 2020 showed mild regression of bilateral consolidations (Fig. 2B). Rapid, bilateral, progression occurred over 11 days, more pronounced on the left side, with complete lower lobe consolidation and development of acute respiratory distress syndrome (Fig. 2C). Follow-up CT images were obtained on April 15th, 2020 which confirmed bilateral lower lobes pulmonary consolidation (Fig. 2D) and ground-glass opacities with crazy paving at upper lobes (Fig. 2E and F). Changes were more extensive on the left side and TSS was 22.

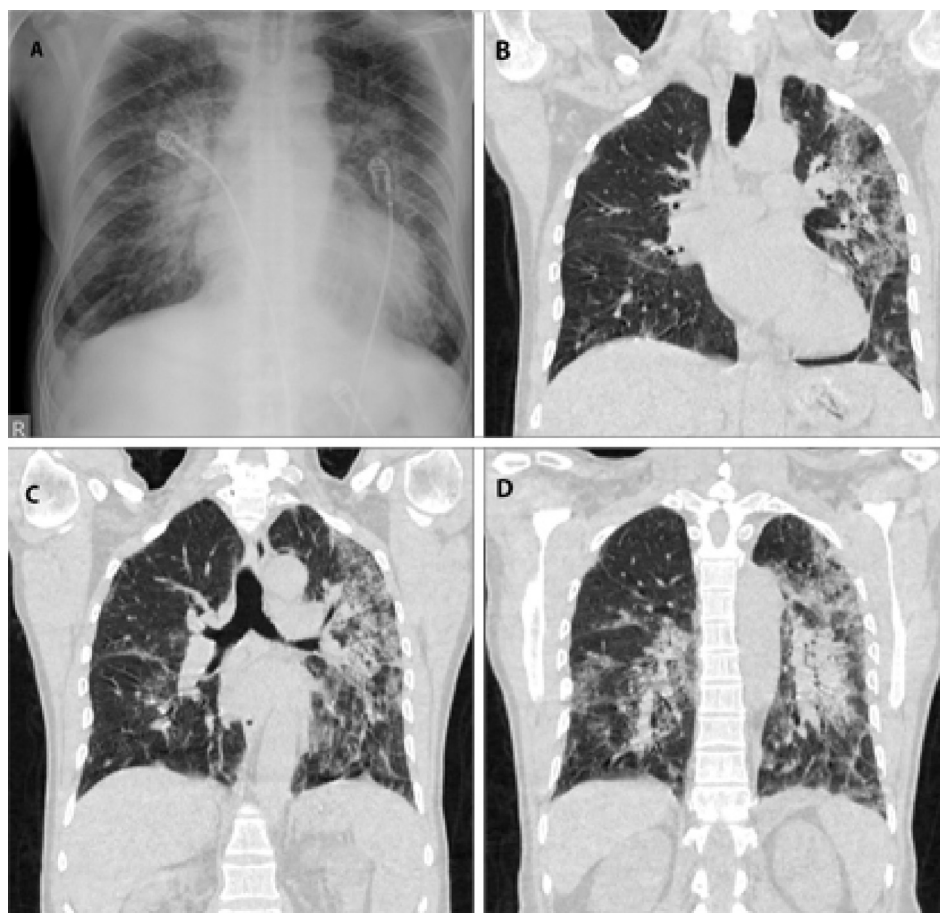
### Case 3

A 63-year-old male presented with fever (temperature 38 °C), cough, chest pain and shortness of breath. Nasopharyngeal swab (RT-PCR) showed a positive result for SARS-CoV-2. They had no

history of being in contact with COVID-19 patients and had not travelled outside his hometown. Mobile CXR was performed with significant, predominantly peri-hilar linear and reticular pattern (Fig. 3A) together with bilateral blunting of the costophrenic angles denoting pleural effusion. CT follow-up, performed 10 days from presentation, showed ground-glass opacities with crazy paving predominantly in the upper and lower left lobes (Fig. 3B–D). Theor TSS was 16.

### Discussion

The most common clinical symptoms of COVID-19 include fever (83%), cough (82%) and shortness of breath (31%).<sup>5</sup> Our case series confirmed that ground-glass opacities and consolidation in the



**Figure 3.** A Mobile chest radiograph (day 0) showing significant predominantly peri-hilar linear and reticular pattern. B,C,D Coronal CT reconstruction (day 10) demonstrates ground-glass opacities with crazy paving predominantly in the upper and lower left lobes.

lung are common findings in imaging for patients with COVID-19 infection.

Reports on COVID-19 continue to rapidly emerge and despite that descriptions of the imaging features of this infection have been limited. A study of Huang et al.<sup>6</sup> reported that 40 patients (98%) had bilateral involvement. Another study of 99 patients, Chen et al.<sup>5</sup> reported that 74 patients (75%) had bilateral pneumonia, with just 25 (25%) having unilateral pneumonia. In this case series, ground-glass opacities and consolidation were predominant in the peripheral zone and involved the left upper and lower lobes for all three patients. Taking into consideration the predominance of ground-glass opacities, chest CT is more sensitive and findings can be missed on radiographs. Of note, confirmed cases also can have normal chest CTs.<sup>7</sup>

In most case series, opacities were described as ground-glass (57%) and mixed attenuation (29%)<sup>1</sup> similar as presented in our case series. Predominant left sided inflammation, as shown in this case series, in COVID-19 disease could be of interest of future investigation.

### Conclusion

Chest CT is more sensitive in COVID-19 diagnosis compared to CXR and in the evaluation of extent of changes and their type. Although radiation dose on CT is higher; with protocol optimisation it can be reduced to levels that are tolerable in comparison to the benefits that they can provide. CT should not be used as a screening method for COVID-19.

### Conflict of interest statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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