



Case report

Evolution of chest CT scan manifestations in a patient recovered from COVID-19 severe pneumonia with acute respiratory distress syndrome

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ABSTRACT

A male patient with severe pneumonia due to coronavirus disease 2019 (COVID-19) had acute respiratory distress syndrome (ARDS) which developed in the second week since the first symptoms and improved without mechanical ventilation. The patient had epilepsy as a comorbid disease and his routinely consumed antiepileptic drugs were likely to cause alterations of the immune system. Ground-glass opacity (GGO), consolidation, and reticular pattern are typical radiological features of COVID-19 pneumonia. Less common findings were septal thickening, bronchiectasis, pleural thickening, and subpleural involvement. These radiological abnormalities evolve throughout the course of the disease. In this case report, a GGO lesion was seen in thin-section CT scans on the 30th and 45th day since the onset of symptoms. The consolidation subsided with time and on the 65th day, minimal GGO was seen in CT scan without pulmonary fibrosis and bronchiectasis.

1. Introduction

At the end of December 2019, several cases of pneumonia of unknown etiology were seen in several hospitals in Wuhan city, China. Those acute respiratory infections were eventually known to be caused by coronavirus infection (nCoV2) and were officially entitled as coronavirus disease 2019 (COVID-19) by World Health Organization (WHO) [1,2] (see Figs. 1–3).

Symptoms that are often found in SARS-CoV2 infection are fever and dry cough. Some patients complain of sore throat, runny nose, anosmia, or diarrhea. Based on the data of hospitalized patients, the majority of COVID 19 cases (around 80%) presented without symptoms (asymptomatic) or with mild symptoms, while the rest of the cases had severe symptoms or critical condition [2]. In severe cases, patients complain of shortness of breath and/or had hypoxemia 1 week after the onset of the disease, and promptly develop into acute respiratory distress syndrome (ARDS), septic shock, and death [3]. Ground-glass opacity (GGO), consolidation, reticular pattern are typical radiological features of COVID-19 pneumonia. In survived patients, these radiological features subsided or disappear [4,5].

2. Case presentation

A 35-year-old man came to the hospital with the chief complaint of fever for 5 days. On the sixth day since the onset of fever, the patient complained of coughing when deep inhaling, coughing up phlegm especially after a shower, shortness of breath, odynophagia, and he went to the emergency room. He also complained of nausea, without vomiting, abdominal pain, and diarrhea. The patient had a history of epilepsy since 12 years-old, routinely taking phenytoin and divalproex sodium.

On physical examination, the patient looks dyspnea with respiration rate 20–21 x/min, temperature 37.3 °C, blood pressure 120/80 mmHg, heart rate 108 x/min, chest X-ray revealed peripheral bilateral patchy consolidation, normal laboratory results, CD4 result 322 cells/mm³ (range 410–1.590 cells/mm³). During hospitalization, the patient was given oxygen 2–4 L/min with a nasal cannula. On the 9th day since the onset of symptoms, the patient complained of worsening shortness of breath and his peripheral oxygen saturation was 88% (8 L/min oxygen therapy with face mask), oxygen therapy was increased to 10–12 L/min with non-rebreathing mask and his peripheral oxygen saturation gradually rose to 95%. The result of blood gas analysis (BGA) was: pH 7.43, PaCO₂ 38.3, PaO₂ 88.6, HCO₃⁻ 25, BE 1.0, SaO₂ 97.3%, (A-a)DO₂ 153.3, PaO₂/FiO₂ 2.3 with FiO₂ 40%. The result of BGA obtained the following

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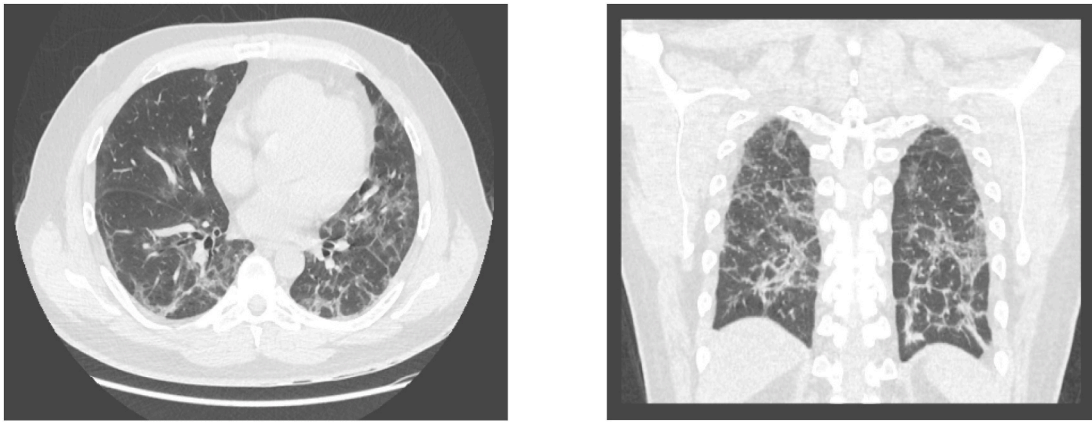


Fig. 1. Chest CT scan on the 30th day of the onset of symptoms (axial and coronal views): Multiple GGO in both lungs, notably in the inferior lobe of the right lung in the posterior and peripheral regions. A pleural band was seen in the lower posterior part of both lungs, and traction bronchiectasis.

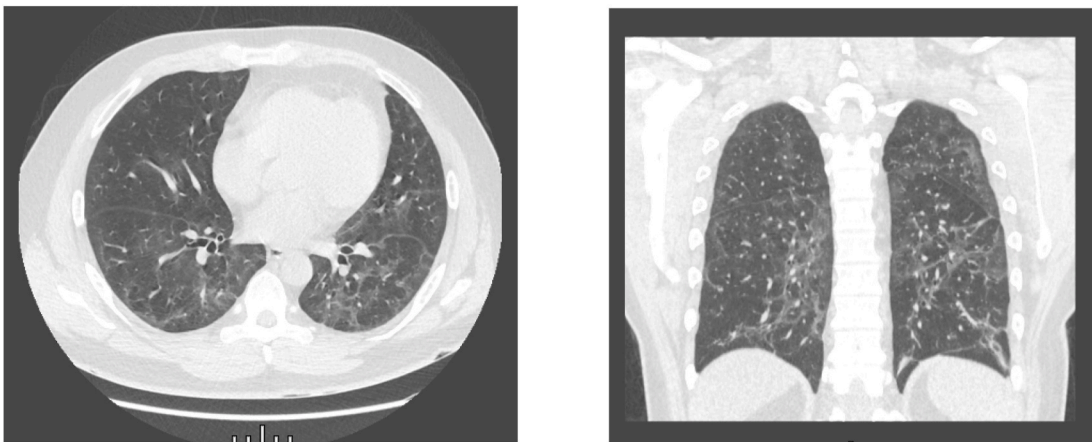
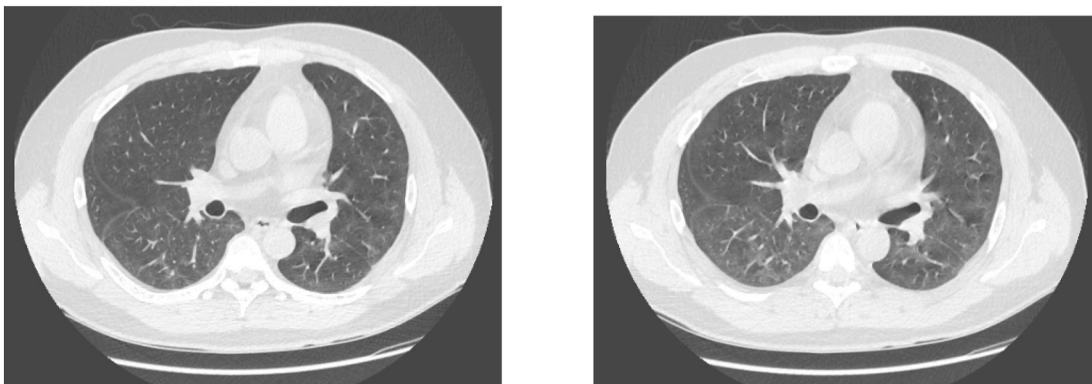


Fig. 2. Chest CT scan on the 45th day of the onset of symptoms (axial and coronal views): GGO was still visible in the posterior and peripheral part of both lungs (improvement compared to the previous CT), with less bronchiectasis and fibrosis.



(a)

(b)

Fig. 3. Chest CT scan on the 65th day of the onset of symptoms: (a). Minimal GGO was seen in the inspiration phase, and (b). On the expiration phase, an “enhancement” of GGO lesion was seen due to an increase of intrathoracic pressure without the sign of “air-trapping”.

day was: pH 7.49, PaCO₂ 41.7, PaO₂ 77.0, HCO₃⁻ 31.2, BE 7.2, SaO₂ 96.3%, (A-a)DO₂ 568.1, PaO₂/FiO₂ 0.78 with FiO₂ 99%. PCR results for SARS-CoV 2 were positive on days 8 and 14 since the onset of the chief complaint. This report has been granted the patient’s approval for publication.

A chest computed tomography (CT) scan was performed on supine position with a 64-slice LightSpeed VCT GE Healthcare with a single breath-hold post of inspiration, except for the last CT scan done in two inspirational and expiratory phases. The image was reconstructed with a thickness of 1.2 mm. On the 30th day of the onset of symptoms, a chest

CT scan revealed multiple GGO in both lungs, notably in the inferior lobe of the right lung in the posterior and peripheral regions, scantily in the upper left and central right lung, a pleural band in the lower posterior part of both lungs, and traction bronchiectasis secondary to fibrosis of the surrounding lung parenchyma.

On the 45th day of the onset of symptom; GGO was still visible in the peripheral posterior part of both lung (an improvement was seen compared to the previous CT though), the subpleural band was seen in the peripheral posterior part of both lung, there was no visible vascular thickening. Improvement was also seen as the disappearance of bronchiectasis and its surrounding fibrosis. Day 65th chest CT scan illustrated thinner GGO compared to previous CT, without fibrosis or bronchiectasis.

3. Discussion

We presented a case of severe COVID-19 pneumonia complicated with acute respiratory distress syndrome (ARDS) which was diagnosed with WHO criteria [6] who recovered with minimal GGO lesion outcome. ARDS is one of the COVID pneumonia complications with high mortality [7]. Age, high body temperature, comorbidities, neutrophilia, lymphocytopenia, index of impaired organ function, increased index of inflammation, and disorders of coagulopathy are risk factors for ARDS [7]. This patient experienced clinical and oxygenation improvement with medical therapy without mechanical ventilation. He had epilepsy since 12 years-old (rarely having seizure episode) as a comorbid and routinely consumes phenytoin and divalproex sodium. Antiepileptic drugs are known to have an immunosuppressant effect. Carbamazepine or valproic acid affects the concentration of cytokines in the blood. Increased proinflammatory cytokines can lead to immune system disorders [8].

Chest CT scan plays an important role in the diagnosis and follow-up of COVID-19 cases [9]. Early features of thin-section CT in COVID-19 cases are predominantly GGO with reticular pattern and/or interlobar septal thickening. Changes in chest CT scan images in patients with COVID-19 pneumonia begin with a predominance of ground-glass opacity at 0–4 days of the onset of symptom, crazy-paving (reticular) pattern at 5–8 days, consolidation at 9–13 days, and consolidation with a gradual resolution at ≥ 14 days, but in this phase, a diffuse GGO can be seen as a manifestation of consolidation absorption [10].

Radiological evolution in COVID-19 pneumonia is generally consistent with the clinical course. Shi et al. [5] reported 4 radiological patterns up to week 3 of the disease. 1) Initial progression until the peak which was followed by radiological improvement (46%) and 92% of patients were discharged from the hospital, 2) Radiologically worsened (32%) followed by 11% deaths, 3) Radiologically improved (14%), 63% of patients discharged from the hospital with a median of 19 days hospitalization, 4). No alteration radiologically (9%).

Thin-section chest CT scan with full inspiration since 30th day since the onset of symptoms in this patient showed GGO in both of the lung, pleural band, and traction bronchiectasis secondary to fibrosis of the surrounding lung parenchyma. These findings were consistent with his clinical conditions (shortness of breath during exertion, peripheral oxygen saturation 93–95% on room air, heart rate 110–112 x/min). Improvement of lung sequelae was seen on the 45th day, CT scan results were still dominated by GGO, however less bronchiectasis and fibrosis. The complaint of shortness of breath had subsided, peripheral oxygen saturation 97–98%, heart rate 84–88 x/min, and RT-PCR result had

converted to negative. CT scan result of the 65th day revealed minimal GGO, no fibrosis nor air trapping was seen in the thin-section expiratory phase of the CT scan as commonly found in the severe acute respiratory syndrome (SARS) cases [11].

4. Conclusion

We presented a COVID-19 severe pneumonia case with neurological diseases comorbid (epilepsy controlled with antiepileptic drugs) which was complicated by ARDS. High body temperature, neutrophilia, lymphocytopenia, decreased CD4 T cells are risk factors for ARDS. Three follow-ups thin-section chest CT scan since the onset of symptoms revealed an improvement and the outcome was minimal GGO without pulmonary fibrosis or bronchiectasis.

Declaration of competing interest

There was no conflict of interest in this study. No funding was received for this study. Written informed consent was obtained for publication of this case report.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.rmcr.2021.101342>.

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