

Case Report



Radiologically Suspected Organizing Pneumonia in a Patient Recovering from COVID-19: A Case Report

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ABSTRACT

We report a case of coronavirus disease 2019 (COVID-19)-associated radiologically suspected organizing pneumonia with repeated negative Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) polymerase chain reaction (PCR) results from nasopharyngeal swab and sputum samples, but positive result from bronchoalveolar lavage fluid. Performing SARS-CoV-2 RT-PCR in upper respiratory tract samples only could fail to detect COVID-19-associated pneumonia, and SARS-CoV-2 could be an etiology of radiologically suspected organizing pneumonia.

Keywords: COVID-19; SARS-CoV-2; Organizing pneumonia; Bronchoalveolar lavage; Polymerase chain reaction

INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) has emerged as a global threat since December 2019, and there is a growing number of studies that have suggested an association between severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and organizing pneumonia [1-3]. Viral-induced organizing pneumonia during the SARS, Middle East respiratory syndrome (MERS), and H1N1 infection has been widely studied in the literature [1, 4, 5]. In an earlier study, COVID-19-associated organizing pneumonia was suggested to be the result of secondary organizing pneumonia after COVID-19 infection or as a histologic variant of COVID-19 pneumonia [1]. However, clinicians are not familiar with SARS-CoV-2 infection as a possible etiology of secondary organizing pneumonia.

Herein, we report on a patient who was diagnosed with COVID-19-associated radiologically suspected organizing pneumonia, whose PCR of nasopharyngeal (NP) swab and sputum samples produced consistent negative results, but whose bronchoalveolar lavage (BAL) fluid tested positive result for SARS-CoV-2.

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Ethics statement

This case report is published with the consent of the patient.

Conflict of Interest

No conflicts of interest.

Author Contributions

Conceptualization: HJS, SHK. Data curation: HJS. Formal analysis: HJS. Funding acquisition: SHK. Methodology: HJS. Software: HJS. Supervision: MJK, JWJ, SJJ, SHK. Writing - original draft: HJS. Writing - review & editing: SHK.

CASE REPORT

A previously healthy 50-year-old man was transferred to Asan Medical Center because of aggravation of dyspnea on exertion. He had presented with an 8-day history of fever and myalgia and had been admitted to hospital. Repeated NP swab samples for real-time polymerase chain reaction (RT-PCR) against SARS-CoV-2, which were performed five times from days 9 to 16 from symptom onset, produced negative results (Fig. 1), and sputum PCR for *Streptococcus pneumoniae* and *Haemophilus influenzae* were positive with cycle threshold (Ct) values of 35.96 and 34.94, respectively 11 days after symptom onset. Chest computed tomography (CT) (day 9 from symptom onset) showed multifocal patchy and nodular ground-glass opacity (GGO) in both lungs, dominantly distributed in the subpleural space, which suggested atypical pneumonia including COVID-19 or cryptogenic organizing pneumonia (Fig. 2A-C). Moxifloxacin 400 mg was administered per day, but the patient developed dyspnea on exertion and cough. On day 17, he was transferred to our hospital. On admission, he had a pulse of 102 bpm, a temperature of 37.4°C, blood pressure of 113/76 mmHg, and oxygen saturation of 94% when breathing room air. NP swab RT-PCR for SARS-CoV-2 continued to be negative. Chest CT (day 17 from symptom onset) showed an increased extent of multifocal patchy GGO (Fig. 2D-F). Even though repeated SARS-CoV-2 RT-PCR tests from NP swabs were negative, atypical pneumonia including COVID-19 or organizing pneumonia could not be excluded because of his radiologic findings in chest CT and background community incidence of COVID-19. Therefore, the patient underwent transbronchial lung biopsy and BAL of the right lower lung lateral basal segment. All the healthcare workers used personal protective equipment, and the patient underwent bronchoscopy at the last time on the day to minimize exposure to other patients and maintain isolation. Transbronchial lung biopsy revealed lymphocytic infiltration with minimal intra-alveolar exudate consistent with viral pneumonia (Fig. 3). RT-PCR for SARS-CoV-2 from BAL fluid returned positive with Ct values of 30.82 for the E gene and 35.38 for the RdRP gene (Allplex™ 2019-nCoV Assay, Seegene, Inc, Seoul, Korea) while RT-PCR for SARS-CoV-2 from NP and sputum were negative. Cultures of BAL fluid showed no microbial growth. All tests were performed on the same day. Thus, the patient was diagnosed with possible secondary organizing pneumonia associated with COVID-19 pneumonia. On day 18, he required 1 L/min oxygen via the nasal cannula. Serum CRP was 1.30 mg/dL and ferritin was 550.5 ng/mL. As we regarded his

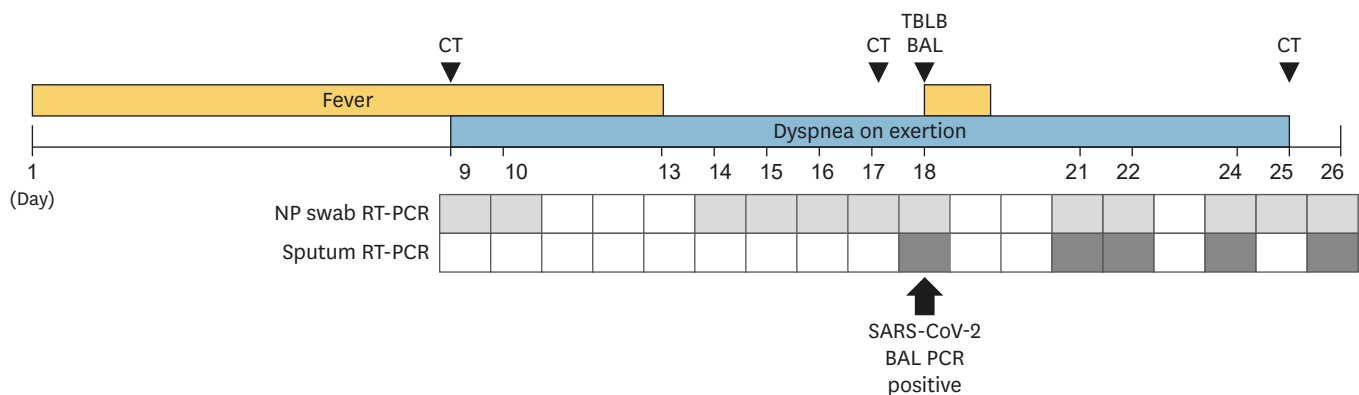


Figure 1. Clinical course of the patient. Light grey-colored squares represent undetected SARS-CoV-2 RNA in nasopharyngeal swabs, and dark grey-colored squares represent undetected SARS-CoV-2 RNA in sputum samples. Black arrow indicates detection of SARS-CoV-2 RNA in BAL fluid. SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; RNA, ribonucleic acid; CT, computed tomography; TBLB, transbronchial lung biopsy; BAL, bronchoalveolar lavage; NP, nasopharyngeal; RT-PCR, real time polymerase chain reaction.

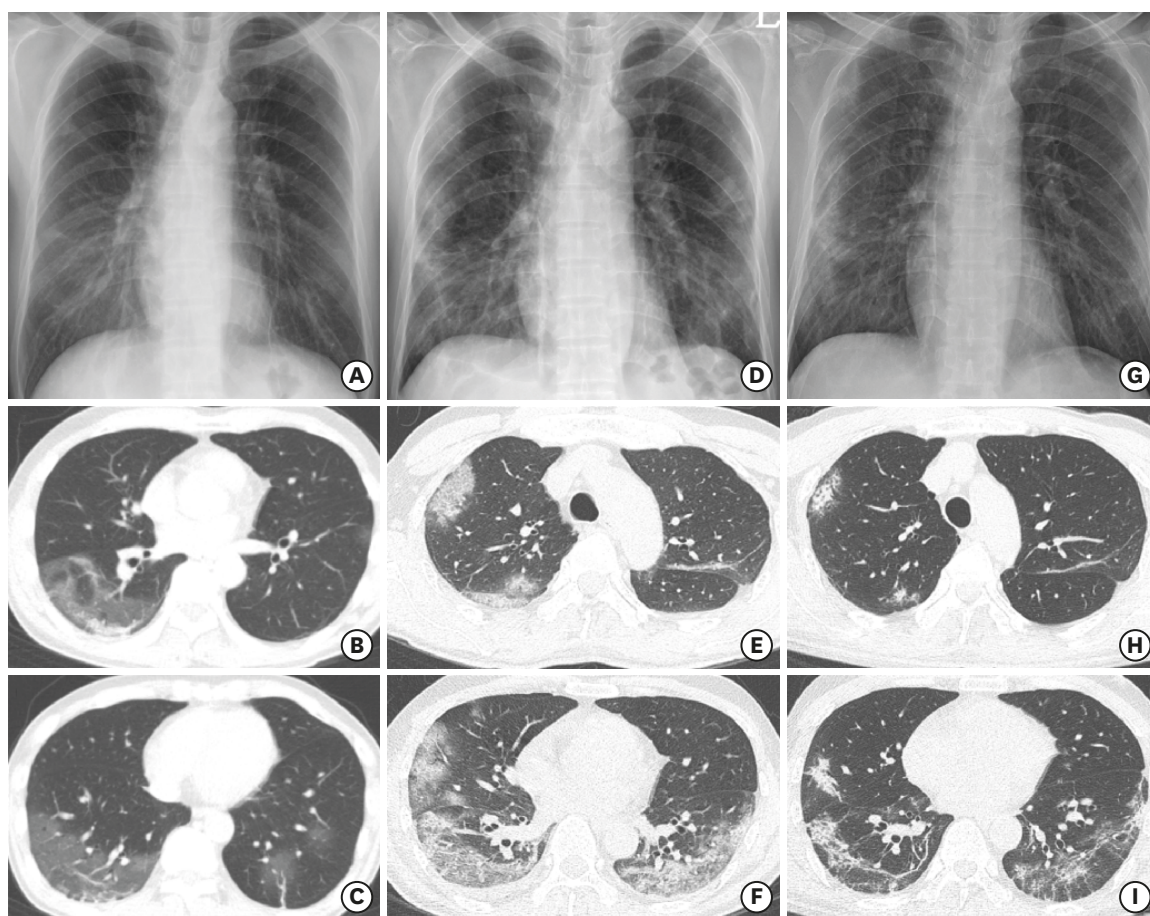
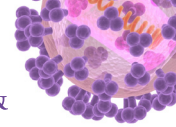


Figure 2. Chest images (A) Chest X-ray on day 9 after symptom onset. (B, C) Chest computed tomography (CT) on day 9 showing multifocal patchy and nodular ground-glass opacity (GGO) in both lungs, distributed dominantly in the subpleural space. (D) Chest X-ray on day 17 from symptom onset. (E, F) Chest CT on day 17 showing increased extent of GGO. (G) Chest X-ray on day 25 from symptom onset. (H, I) Chest CT on day 25 showing improvement of GGO and decreased extent.

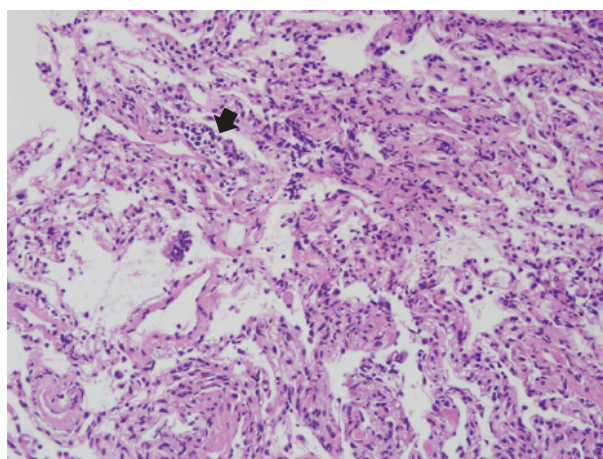


Figure 3. Histopathologic finding of transbronchial lung biopsy from right lower lung lateral basal segment. Mild cellular interstitial pneumonia with minimal intra-alveolar exudate, lymphocytic infiltration (arrow), consistent with viral pneumonia (hematoxylin and eosin stain, X 200).

clinical status was more consistent with organizing pneumonia rather than active COVID-19 pneumonia, we did not administer an antiviral agent such as remdesivir. His fever subsided

the next day. Systemic corticosteroid treatment was planned in the event of symptom aggravation; however, a chest X-ray showed signs of improvement. Serum IgG and IgM for SARS-CoV-2 were positive on day 23. His respiratory symptoms and chest X-ray results improved slowly and oxygen was no longer required. Chest CT showed improvement of subpleural GGO (Fig. 2G-I), and the patient was discharged the next day.

DISCUSSION

Here, we present a case of a patient with radiologically suspected organizing pneumonia after development of COVID-19 pneumonia, whose SARS-CoV-2 RT-PCR tests from repeated NP swab samples and sputum specimens produced negative results. After the patient has recovered from COVID-19 pneumonia, it is suggested that dead virus particles remained in the lower respiratory tract and caused secondary organizing pneumonia although we could not perform viral culture for SARS-CoV-2. These virus particles could only be detected from samples of BAL fluid. A previous study has shown that sensitivity to SARS-CoV-2 is higher in specimens in the lower respiratory tract compared with the upper respiratory tract [6]. Moreover, Wang et al. reported that BAL fluid specimens presented the highest positive detection rate of SARS-CoV-2, followed by sputum, and nasal swabs [7]. Our case indicates that there is a risk of repeated false negative tests in NP swabs and sputum specimens for detection of COVID-19 pneumonia, and clinicians should be aware of the importance of performing RT-PCR in lower respiratory tract specimens, including BAL fluid if necessary. Further study is required to compare the diagnostic performance of SARS-CoV-2 PCR on different specimens for detection of COVID-19 pneumonia.

Okamori et al. reported two cases of COVID-19-associated organizing pneumonia, of which showed clinical improvement with administration of systemic corticosteroids [2]. However, our patient case was not diagnosed with COVID-19 pneumonia until he underwent bronchoscopy, and his symptoms improved without steroids. There is another study that has reported a case with COVID-19-associated organizing pneumonia, in which RT-PCR for SARS-CoV-2 was only positive in the BAL fluid, as in our case [3]. Pogatchnik et al. showed biopsy with fibromyxoid plugs that indicated the pathology of organizing pneumonia. Pathology findings in our case did not show fibroblastic plug; however, because lung specimens were obtained through a transbronchial biopsy, there is a chance that the accuracy of biopsy targeting was not high enough to demonstrate this pathologic finding.

Our report has several limitations. First, there have been reports on organizing pneumonia following *H. influenzae* or *S. pneumoniae* pneumonia [8-10], and some may argue that these organisms caused secondary organizing pneumonia in our case. However, the radiologic findings corresponded with a COVID-19 diagnosis, and a positive SARS-CoV-2 PCR result from the BAL strongly suggest that prior or concurrent SARS-CoV-2 infection may have caused the organizing pneumonia. Second, although the patient in our case successfully recovered without an antiviral agent or steroid, this does not implicate that COVID-19-associated organizing pneumonia does not require systemic corticosteroid treatment. Further study is needed to distinguish the clinical characteristics of patients with COVID-19-associated pneumonia who need steroid treatment and those who recover without it.

In conclusion, we report a case of COVID-19-associated radiologically suspected organizing pneumonia with negative SARS-CoV-2 RT-PCR from repeated NP swabs. Our study suggests

that performing SARS-CoV-2 RT-PCR only from the upper respiratory tract could fail to detect COVID-19 pneumonia, and that SARS-CoV-2 could be one of the pathogens involved in the etiology of radiologically suspected organizing pneumonia.

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