

[CASE REPORT]

Community-acquired Respiratory Virus Cases Mimic COVID-19 on Lung Computed Tomography

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Abstract:

We herein report four patients with community-acquired respiratory virus (CRV) infection. Although they had no history of contact with any individual with coronavirus disease 2019 (COVID-19), they were suspected of having COVID-19 based on findings of high-resolution computed tomography (CT) of the lungs. Among the four patients, two were infected with rhinovirus, one with metapneumovirus, and one with influenza A. Their chest CT findings were similar to those of COVID-19 patients reported in previous studies. Both CRV infection and COVID-19 can show various patterns on chest CT. CRV infection is thus indistinguishable from COVID-19 based on CT findings alone.

Key words: coronavirus disease 2019, community-acquired respiratory virus, rhinovirus, metapneumovirus, influenza virus, viral pneumonia

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Introduction

The outbreak of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), began in December 2019 and has caused an ongoing pandemic. Since then, healthcare workers worldwide have been cautious when treating patients with pneumonia. Cases of pneumonia associated with community-acquired respiratory virus (CRV) have been reported since well before the COVID-19 pandemic. Indeed, CRV is a major pathogen of community-acquired pneumonia (CAP) (1), and in particular, infection with influenza virus often causes pneumonia (2, 3).

Under the COVID-19 pandemic, patients with a fever or respiratory failure are often examined using chest computed tomography (CT) for rapid triage in the emergency department (4). In our hospital, Okinawa Chubu Hospital, Okinawa, Japan, many patients are examined using CT for this same purpose, and some patients who test positive for CRV are thus suspected of having COVID-19 based on the CT findings.

We herein report our experience with four patients with CRV infection that mimicked COVID-19 on chest CT during the first wave of the COVID-19 outbreak in Okinawa. Furthermore, we discuss the chest CT findings of patients with CRV infection, including those with COVID-19. The medical records of the cases were retrospectively reviewed, and identifying information was removed.

Case Reports

The four presented patients developed pneumonia from January to March 2020. COVID-19 infections were rare in Okinawa in the study period. None of the patients had a confirmed contact history with individuals with COVID-19. However, they were suspected of having COVID-19 based on the chest CT findings. For our patients, the clinical history and multiplex polymerase chain reaction (PCR) test results were helpful for the differential diagnosis. COVID-19 was ruled out in our patients by PCR of SARS-CoV-2 at local public health institutes or their clinical history at admission. In addition, their specimens used for multiplex PCR were confirmed negative on PCR of SARS-CoV-2. Commer-

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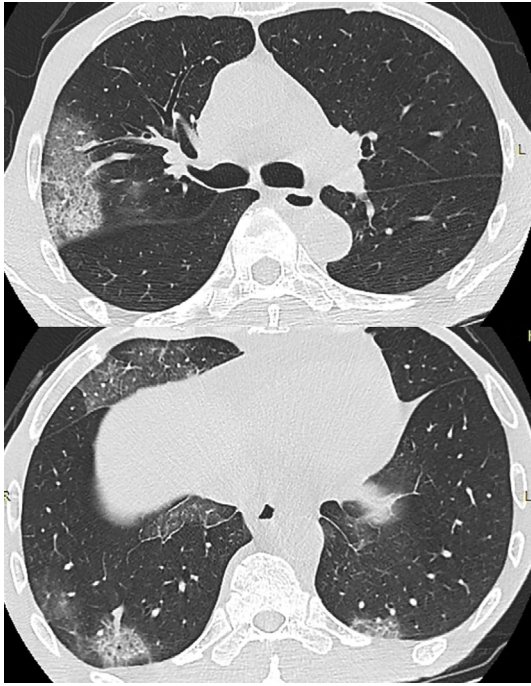


Figure 1. Chest CT findings in Case 1. Case 1 was positive for rhinovirus. High-resolution CT of the lung shows peripheral ground-glass opacity in the right upper lung with smooth interlobular septal thickening. Multiple patchy ground-glass opacities are also observed.

cially available PCR kits (Anyplex™ II RV16 Detection, Allplex™ Respiratory Panel 1A, and Anyplex™ 2019-nCoV Assay, Seegene, Seoul, Korea) were used to detect CRV and confirm SARS-CoV-2 negativity at the University of the Ryukyus.

Case 1

A 62-year-old man with type 2 diabetes mellitus and type C hepatitis was brought to the emergency department by ambulance due to a fever and an altered mental status. Chest CT showed multiple ground-glass opacities (GGOs) (Fig. 1). The patient was suspected of having COVID-19 and isolated. His respiratory condition worsened, and he was eventually placed on invasive mechanical ventilation for four days. The results of PCR performed using the patient's nasal swab showed negative findings for SARS-CoV-2. However, the results of test performed using the patient's bronchoalveolar lavage fluid sample showed positive findings for rhinovirus. The patient recovered and was eventually discharged.

Case 2

A 53-year-old woman with type 2 diabetes mellitus was transferred to our hospital for management of an altered mental status and acute respiratory failure. She had a history of contact with a coughing individual who did not have COVID-19. She also had a productive cough with wheezing for several days. Chest CT showed localized subpleural GGO (Fig. 2). The patient was placed on invasive mechani-



Figure 2. Chest CT findings in Case 2. Case 2 was positive for metapneumovirus. High-resolution CT of the lung shows focal ground-glass opacity with a round shape in the left lower lung close to the pleura.

cal ventilation for three days. She was isolated until the results of PCR performed using her nasal swab showed the absence of SARS-CoV-2, as COVID-19 could not be ruled out initially. The results of PCR performed using the patient's tracheal sputum sample showed the presence of metapneumovirus. The patient recovered and was eventually discharged.

Case 3

A 76-year-old woman with bronchial asthma presented to our emergency department due to complaints of dyspnea and wheezing. The patient was diagnosed with asthma attack. However, chest CT showed the presence of GGO with a crazy-paving appearance in the right upper lobe of lung. The patient was suspected of having COVID-19 (Fig. 3) and isolated. The results of PCR performed using the patient's nasal swab showed negative findings for SARS-CoV-2 and positive findings for rhinovirus.

Case 4

A 45-year-old man with bronchial asthma presented to our emergency department with complaints of a fever, cough, diarrhea, and general fatigue. Prior to the visit, the patient had undergone rapid antigen testing for influenza virus at a local clinic, which revealed negative results. Chest CT showed multiple GGOs (Fig. 4). The patient had no travel history or history of contact with a resident of endemic countries. COVID-19 was thus ruled out, and the patient was admitted without isolation. The patient was treated as an atypical pneumonia patient and eventually discharged. However, the results of PCR performed using the patient's expectorated sputum sample showed positive findings for H1N1pdm09 virus.

Discussion

COVID-19 is often associated with acute respiratory dis-



Figure 3. Chest CT findings in Case 3. Case 3 was positive for rhinovirus. High-resolution CT of the lungs shows ground-glass opacity with an irregular shape due to thickened interlobular septa (crazy-paving appearance) localized in the right upper lung.

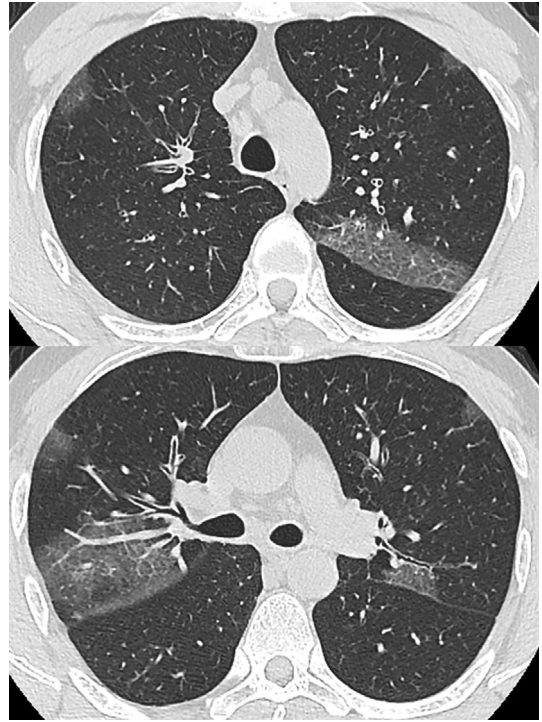


Figure 4. Chest CT findings in Case 4. Case 4 was positive for influenza virus A (H1N1pdm09 virus). High-resolution CT of the lung shows bilateral subpleural multiple ground-glass opacity with enlarged blood vessels. Airway-centric distribution of GGO and bronchial wall thickening are also observed.

ress syndrome (ARDS) (5). Patients with ARDS caused by COVID-19 show peripheral, bilateral, round GGO lesions on chest CT (6). The chest CT findings of patients with COVID-19 therefore often resemble those of patients with interstitial lung disease (7-9). In cases of lower respiratory tract infection caused by CRV, chest CT generally shows an airway-centric distribution, such as bronchopneumonia (10, 11); however, atypical distribution of GGO is occasionally observed. In such cases, a diagnosis of interstitial lung disease is made (12, 13). The chest CT findings of patients with CRV infection and those with COVID-19 can therefore be similar. Recent studies have demonstrated difficulties in distinguishing COVID-19 from influenza viral infection based on chest CT findings (8, 14).

Although the chest CT findings in our four patients displayed various patterns, those reported in previous studies on COVID-19 were similar to those observed in our four patients (7, 9, 14-17) (Case 1: unilateral and bilateral peripheral GGOs and GGO with smooth interlobular septal thickening; Case 2: single and multiple round-shaped GGOs; Case 3: GGO with crazy-paving appearance; Case 4: multiple subpleural GGOs and GGO with enlarged blood vessels). Furthermore, COVID-19 can show various patterns on chest CT, depending on the duration of infection (18, 19). A CRV infection may thus be indistinguishable from COVID-19 based on CT findings alone.

In a systematic review, CRV was detected in 22% individuals with CAP (1). In the future, SARS-CoV-2 may become a pathogen associated with CAP, similar to H1N1pdm09 virus (3). Under present conditions, it is diffi-

cult to diagnose COVID-19 in individuals with pneumonia and interstitial lung disease (15). Physicians should be aware of the non-specificity of chest CT findings for diagnosing pneumonia, including CRV and COVID-19.

The authors state that they have no Conflict of Interest (COI).

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