



Novel Coronavirus Pneumonia Outbreak in 2019: Computed Tomographic Findings in Two Cases

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Since the 2019 novel coronavirus (2019-nCoV or officially named by the World Health Organization as COVID-19) outbreak in Wuhan, Hubei Province, China in 2019, there have been a few reports of its imaging findings. Here, we report two confirmed cases of 2019-nCoV pneumonia with chest computed tomography findings of multiple regions of patchy consolidation and ground-glass opacities in both lungs. These findings were characteristically located along the bronchial bundle or subpleural lungs.

Keywords: Severe acute respiratory infection; 2019 novel coronavirus; Computed tomography

INTRODUCTION

Since December 2019, a succession of cases of pneumonia with unknown causes has appeared in Wuhan, Hubei Province, China. On January 7, 2020, the 2019 novel coronavirus (2019-nCoV or officially named by the World Health Organization as COVID-19) was identified as the causative agent based on virus typing (1, 2). By January 27, 2020, 2823 cases were confirmed, with 81 deaths. To date, there have been a few reports of chest computed tomography (CT) findings in patients infected by 2019-nCoV. Here, we report chest CT findings in two patients confirmed with 2019-nCoV pneumonia at Jiangxi Provincial People's Hospital. This report was approved by Jiangxi Provincial People's Hospital Institutional Review Board, and the requirement for informed consent was waived.

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CASE REPORT

Case 1

A 35-year-old man presented with fever for 3 days and cough for 2 days and was admitted to the emergency department of Jiangxi Provincial People's Hospital. The patient had a history of good physical health with no underlying diseases but had returned to Nanchang, Jiangxi Province, from Wuhan 1 week before. Physical examination showed fever, with a body temperature of 38.7°C, and the laboratory examination results showed a normal leukocyte count (5520/μL), increased neutrophils (76.2%), decreased lymphocytes (16.1%), elevated glucose (7.4 mmol/L), and elevated C-reactive protein (14.00 mg/L). The patient tested negative for eight common respiratory pathogens, which were respiratory syncytial virus, adenovirus, influenza A virus, *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *Legionella pneumophila*, parainfluenza virus, and influenza B virus, and the influenza A antigen screening was also negative. Finally, he was diagnosed with 2019-nCoV based on the real-time reverse-transcriptase-polymerase chain reaction (rRT-PCR) amplification of the viral DNA from a sputum sample.

CT showed multiple regions of patchy consolidation and ground-glass opacities with indistinct border in both lungs. The lesions were distributed along the bronchial bundles or within the subpleural lung regions (Fig. 1). Neither pleural

effusion nor lymphadenopathy was found.

Case 2

A 39-year-old man presenting with fever and throat discomfort for 2 days was admitted to Jiangxi Provincial

People's Hospital fever clinic. He had a history of good physical health and no underlying diseases. Although the patient had not visited Wuhan recently, he had a history of contact with the patient described in Case 1. Physical examination showed fever, with a temperature of



Fig. 1. Thirty five-year-old man with 2019-novel coronavirus pneumonia.

A-D. Axial computed tomography (CT) images of upper, middle, and lower lobes of right lung and lower lobe of left lung show multifocal regions of patchy consolidation and nodular ground-glass opacities, mainly distributed along bronchial bundles and subpleural regions. **E.** Coronal reformation CT image shows multifocal nodular groundglass opacities in right lower lung lobe.

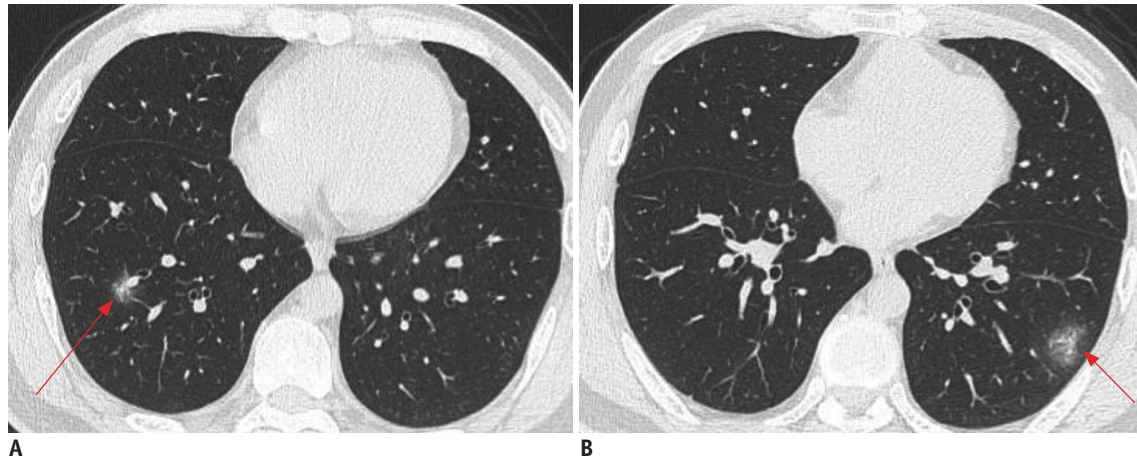


Fig. 2. Thirty nine-year-old man with 2019-novel coronavirus pneumonia.

A, B. High-resolution computed tomography images show ill-defined focal consolidation (arrow) along bronchovascular bundles in right lower lung lobe (**A**) and ill-defined ground-glass opacities (arrow) in subpleural regions of left lower lung lobe (**B**).

39.3°C, and laboratory examination results demonstrated a normal leukocyte count (5320/ μ L), normal neutrophils (67.6%), normal lymphocytes (24.5%), decreased aspartate aminotransferase (14 IU/L), elevated glucose (6.8 mmol/L), and normal CRP (4.00 mg/L). Finally, he was diagnosed with 2019-nCoV based on the rRT-PCR analysis of a sputum sample.

CT imaging showed small ill-defined ground-glass opacities in both lower lung lobes. The lesion in the left lower lobe was located in the subpleural region while the one in the right lower lobe was distributed along the bundles (Fig. 2). Neither pleural effusion nor lymphadenopathy was found.

DISCUSSION

Cases of 2019-nCoV pneumonia are caused by a novel type of coronavirus. The 2019-nCoV is the seventh member of the coronavirus family that includes Middle East Respiratory Syndrome Coronavirus and Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) (1-4). Most early patients had a history of exposure to the South China Seafood Market in Wuhan. The source of infection is thought to be wild animals, possibly the Chinese rufous horseshoe bat (*Rhinolophus sinicus*) (5-8). Transmission of 2019-nCoV is mainly via droplets but can also be through contact. People are generally susceptible to the 2019-nCoV infection and the elderly patients or those with underlying diseases are more seriously affected. The incubation period of 2019-nCoV is generally 3-7 days but no longer than 14 days, and the virus is infective during the incubation period. The

main symptom is fever with a temperature > 38°C. Other symptoms include fatigue, dry cough, and diarrhea, and acute respiratory distress syndrome can occur in severe cases (9, 10).

The two patients described here were admitted to our hospital because of fever and relatively mild symptoms. According to the laboratory examination results, both patients had normal leukocyte counts. However, case 1 had a reduced percentage of lymphocytes and elevated CRP levels, consistent with viral infections. In case 2, the percentage of lymphocytes and CRP levels were normal, although this difference may be attributed to the milder symptoms of this patient. As a result, this case was prone to misdiagnosis in the clinic. However, 2019-nCoV pneumonia was diagnosed in case 2 based on the characteristic CT findings, which were further confirmed using positive results of the timely rRT-PCR analysis.

Both patients reported here showed multiple areas of patchy consolidation and ground-glass opacities in both lungs, with most of the lesions distributed along the bronchial bundles or in the subpleural areas, particularly in the lower lobes. Neither patient showed pleural effusion or lymphadenopathy. In the SARS outbreak in 2003, infected patients exhibited rapid progression of lung lesions, with both lungs showing diffuse infiltration within a short period and producing "white lungs" and mediastinal emphysema (11, 12). In contrast, these lung lesions are relatively mild and are easily misdiagnosed as bronchopneumonia or any common viral infection. In addition, no obvious fibrosis was found in these cases, which may be related to the short course and mild intensity of the disease in these patients;

this speculation remains to be confirmed using subsequent large-scale studies.

In conclusion, we report the CT findings in two patients with 2019-nCoV pneumonia. Chest CT showed multiple regions of patchy consolidation and ground-glass opacities. Furthermore, the lesions were typically distributed along the bronchial bundles or subpleural regions in both lungs. In patients with a history of fever or contact with the epidemic area combined with the CT findings described here, timely detection of the novel coronavirus DNA is required to ensure early diagnosis, isolation, and treatment.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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REFERENCES

- Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020 Jan 24 [Epub]. <https://doi.org/10.1056/NEJMoa2001017>
- Chen Y, Liu Q, Guo D. Coronaviruses: genome structure, replication, and pathogenesis. *J Med Virol* 2020 Jan 22 [Epub]. <https://doi.org/10.1002/jmv.25681>
- Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan China: the mystery and the miracle. *J Med Virol* 2020 Jan 16 [Epub]. <https://doi.org/10.1002/jmv.25678>
- Choi WJ, Lee KN, Kang EJ, Lee H. Middle East respiratory syndrome-coronavirus infection: a case report of serial computed tomographic findings in a young male patient. *Korean J Radiol* 2016;17:166-170
- Eurosurveillance Editorial Team. Note from the editors: novel coronavirus (2019-nCoV). *Euro Surveill* 2020;25. pii=2001231
- Corman VM, Landt O, Kaiser M, Molenkamp R, Meijer A, Chu DK, et al. Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. *Euro Surveill* 2020;25. pii=2000045
- Gralinski LE, Menachery VD. Return of the coronavirus: 2019-nCoV. *Viruses* 2020;12. pii: E135
- The Lancet. Emerging understandings of 2019-nCoV. *Lancet* 2020;395:311
- Rubin EJ, Baden LR, Morrissey S, Campion EW. Medical journals and the 2019-nCoV outbreak. *N Engl J Med* 2020 Jan 27 [Epub]. <https://doi.org/10.1056/NEJMe2001329>
- Hui DS, I Azhar E, Madani TA, Ntoumi F, Kock R, Dar O, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - The latest 2019 novel coronavirus outbreak in Wuhan, China. *Int J Infect Dis* 2020;91:264-266
- Ooi GC, Khong PL, Müller NL, Yiu WC, Zhou LJ, Ho JC, et al. Severe acute respiratory syndrome: temporal lung changes at thin-section CT in 30 patients. *Radiology* 2004;230:836-844
- Müller NL, Ooi GC, Khong PL, Zhou LJ, Tsang KW, Nicolaou S. High-resolution CT findings of severe acute respiratory syndrome at presentation and after admission. *AJR Am J Roentgenol* 2004;182:39-44