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Case Report

Recurrence of positive SARS-CoV-2 RNA in COVID-19: A case report

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ABSTRACT

The ongoing outbreak of COVID-19 that began in Wuhan, China, has constituted a Public Health Emergency of International Concern, with cases confirmed in multiple countries. Currently, patients are the primary source of infection. We report a confirmed case of COVID-19 whose oropharyngeal swab test of SARS-CoV-2 RNA turned positive in convalescence. This case highlights the importance of active surveillance of SARS-CoV-2 RNA for infectivity assessment.

Introduction

Since December 2019, SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2; previously known as 2019-nCoV) has generated over 70000 cases of COVID-19 (Corona Virus Disease 2019, formerly known as Novel Coronavirus Pneumonia, NCP) in China, including 1870 deaths, as of 17 February 2020 (National Health Commission of the People's Republic of China, 2020). The epidemic has been spreading to 25 other countries, with 794 confirmed cases and three deaths, reported by World Health Organization (WHO) on 17 February (World Health Organization, 2020). Respiratory droplets and contact are considered the main routes of transmission. Currently, COVID-19 patients remain the primary source of infection (Chan et al., 2020; General Office of National Health Commission and General Office of National Administration of Traditional Chinese Medicine, 2020; Special Expert Group for Control of the Epidemic of Novel Coronavirus Pneumonia of the Chinese Preventive Medicine Association, 2020). We report a case of COVID-19 with recurrently positive SARS-CoV-2 ribonucleic acid (RNA) from an oropharyngeal swab test.

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Case presentation

A 46-year-old woman developed a fever of 38.3 °C with no other apparent symptoms on 17 January 2020. After taking two-day oral antibiotics, the temperature returned normal. On 23 January, she suffered from sore throat, cough, and chest distress, with a body temperature of 37.3 °C. The next day, she came to the fever clinic of the Third Affiliated Hospital of Sun Yat-sen University.

She disclosed that she had been traveling in Wuhan from 11 to 13 January with a friend who had been diagnosed as a confirmed case of COVID-19 on 19 January. She denied any exposure to the Huanan seafood market or wild animals.

A high-resolution computed tomography (HRCT) of the chest was performed immediately, images of which reported multiple patchy ground-glass opacities in bilateral subpleural areas (Figure 1). Given the travel history and chest HRCT findings, she was admitted to an airborne-isolation unit as a suspected case of COVID-19.

On admission, physical examination revealed normal vital signs with oxygen saturation of 98% while the patient was breathing ambient air. Lung auscultation revealed no rhonchi. Arterial blood gas analysis indicated no abnormality with arterial oxygen tension (PaO2) of 105 mmHg and an oxygenation index of 499 mmHg. Blood routine tests, liver function, renal function, myocardial enzymes, electrolyte, and serum procalcitonin were normal. The antigen test for influenza A and B was negative. IgM test for influenza A and B, parainfluenza, respiratory syncytial virus, adenovirus, *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*,

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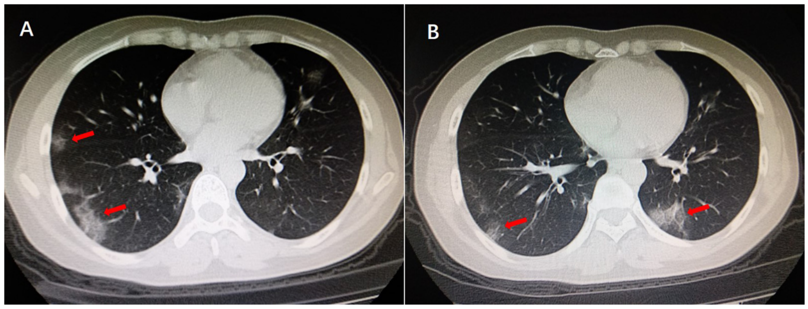

Figure 1. Chest HRCT images on 23 January 2020, showing multiple patchy ground glass opacities in bilateral subpleural areas (red arrows). HRCT, high-resolution computed tomography.

Rickettsia burnetii, and *Legionella pneumophila* was negative. On 24 January, the Centers for Disease Control (CDC) confirmed that the patient's oropharyngeal swab test of SARS-CoV-2 by qualitative real-time reverse-transcriptase–polymerase-chain-reaction (RT-PCR) assay was positive. According to the diagnostic criteria in China (General Office of National Health Commission and General Office of National Administration of Traditional Chinese Medicine, 2020), she was confirmed as a COVID-19 patient.

The patient's respiratory symptoms improved, and she maintained normal body temperature after symptomatic treatment and antimicrobial therapy, including oseltamivir, arbidol, Lopinavir/ritonavir, and moxifloxacin. Oropharyngeal swab tests of SARS-CoV-2 RNA were performed repeatedly for surveillance (Table 1). Exceptionally, the result was positive on 2 February, with a viral load of 4.56×10^2 copies/mL detected by quantitative real-time PCR. The dynamics of chest HRCT revealed gradual absorption of lung lesions. On 9 February, she was discharged and encouraged to maintain home quarantine for at least 14 days. SARS-CoV-2 RNA by oropharyngeal swab remained negative in her follow-up visit on 17 February.

Discussion

The WHO Director-General declared that the outbreak of COVID-19 constitutes a Public Health Emergency of International Concern on 30 January 2020. The spectrum of this disease ranges from mild to life-threatening. Some cases might progress rapidly to acute respiratory distress syndrome (ARDS) and/or multiple organ function failure. An epidemiological survey indicated that the general population is susceptible to SARS-CoV-2. Respiratory droplets and contact are considered the main routes of transmission. COVID-19 patients currently remain the primary source of infection. Asymptomatic carriers and those in the incubation period may also be infectious (General Office of National Health Commission and General Office of National Administration of Traditional Chinese Medicine, 2020; Rothe et al., 2020; Special Expert Group for Control of the Epidemic of Novel Coronavirus Pneumonia of the Chinese Preventive Medicine Association, 2020; Yu et al., 2020). Recognition, quarantine, and treatment of the confirmed patients are critically important.

People with positive SARS-CoV-2 RNA by respiratory tract specimens are probably an infectious source of COVID-19. According to the guideline in China, patients should be isolated until two consecutive SARS-CoV-2 RNA tests of respiratory tract specimens are both negative, with an interval of at least 24 h (General Office of National Health Commission and General Office of National Administration of Traditional Chinese Medicine, 2020).

However, the patient we report in this article presented an inconsistent situation. The oropharyngeal swab test for SARS-CoV-2 RNA on 2 February became positive again after two consecutively negative results on 28 January and 30 January, while her respiratory symptoms had already improved, and she had no fever. In other words, she was still capable of transmitting the virus to other people if she had been discharged right after the second negative test.

We speculate on the reasons why the results of the SARS-CoV-2 RNA tests, in this case, were fluctuant. First of all, no research has yet accurately established the contagious period of COVID-19. Besides patients and asymptomatic carriers, those in convalescence may also be infectious. SARS-CoV-2 RNA from respiratory tract specimens may be persistent or recurrently positive during the course of this disease. Furthermore, Angiotensin-converting enzyme-2 (ACE-2), identified as the cell entry receptor of SARS-CoV-2, was highly expressed in the lungs rather than in the upper respiratory tract (Lu et al., 2020; Zhou et al., 2020). The result of the SARS-CoV-2 RNA test likely depends on the viral load of the specimen. Therefore, there could be false negatives on occasion for oropharyngeal or nasopharyngeal swabs tests, affected by the site from which the sample was taken, the experience of the operator, and the actual quantity of virus. The Bronchoalveolar lavage fluid (BALF) specimen test is considered more accurate but with a higher exposure risk. In addition to the above specimens, SARS-CoV-2 RNA can be detected in a patient's sputum, blood, or stool swab by RT-PCR assay. Running multiple tests and collecting different specimens would be more effective approaches to maximize sensitivity. Combination with the SARS-CoV-2 RNA test and other detective methods such as a specific antigen, IgM antibody, or the next-generation sequencing, is also conducive to diagnosis.

Given the possibility of recurrently positive SARS-CoV-2 RNA in the clinical course and to reduce the risk of transmission in other COVID-19 cases, we suggest that: (1) both nasopharyngeal and oropharyngeal swabs test for SARS-CoV-2 RNA should be performed to reduce the false-negative rate. More tests, more

Table 1
The dynamics of oropharyngeal swab test of SARS-CoV-2 RNA.

Date	1–24	1–28	1–30	2–2	2–5	2–7	2–17
Day after onset	Day 8	Day 12	Day 14	Day 17	Day 20	Day 22	Day 32
SARS-CoV-2 RNA (copies/mL)	Positive	Negative	Negative	4.56×10^2	Negative	Negative	Negative
Body temperature	Normal	Normal	Normal	Normal	Normal	Normal	Normal

SARS-CoV-2, Severe Acute Respiratory Syndrome Coronavirus 2; RNA, ribonucleic acid.

specimens, and more methods could be considered. (2) Patients in convalescence should also be regularly tested for infectivity assessment, and all the discharged patients should be home-quarantined for at least 14 days.

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Ethical approval

Informed consent was obtained from the patient for publication of this case report and accompanying image.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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