



Family cluster of asymptomatic infections with COVID-19: a case series of 4 patients

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Introduction

In December 2019, several cases of “unknown viral pneumonia” were reported in Wuhan City, Hubei Province, China (1). It was named as the 2019 novel coronavirus disease (COVID-19) by the World Health Organization (WHO) (1). In just two months, the virus has spread from Wuhan to other parts of China, and all over the world. By 24:00 on March 8, accumulative 80,735 confirmed cases with 5,111 severe cases, 58,600 cured cases, and 3,119 deaths were documented in China (2). Accumulative 29,215 confirmed cases, 3,343 cured cases and 707 deaths were documented in countries outside of China (3). With the development of the epidemic, the clustered cases were found (4). The incubation period of COVID-19 is generally 3 to 7 days. COVID-19 is also highly contagious in the incubation period (5). The main clinical manifestations are fever, fatigue, dry cough, dyspnea, with or without nasal obstruction, runny nose, and other upper respiratory symptoms. There are also asymptomatic infections (6). Asymptomatic infections make the prevention and control of COVID-19 even harder. This paper reports the discovery process of 4 cases of asymptomatic infected people with familial cluster.

Case presentation

The discovery process of the cases

The patient (case 1) came from Wuhan to Shenzhen by train at 9:00 on January 21, 2020, and stayed at room

relatively ‘isolated’ after he got to his son’s (case 2) home. He measured temperature every day, and had no respiratory symptoms such as fever and cough. His daughter-in-law (case 3) worked in a hospital. On February 9, 2020, at the request of the hospital, his son and daughter-in-law underwent chest CT screening in the department of medical imaging of Peking University Shenzhen Hospital, Shenzhen, China. The chest CT of his son was highly suggestive of COVID-19 pneumonia, while his daughter-in-law’s chest CT had no manifestation of COVID-19 pneumonia.

Case1 was immediately notified to undergo a chest CT examination. His chest CT was also highly suggestive of COVID-19 pneumonia. The patient, his son, and his daughter-in-law carried out the reverse transcription-polymerase chain reaction (RT-PCR) for throat swab samples on the same day.

On February 10, 2020, the patient’s wife (case 4) and his older granddaughter (case 5) were asked for a chest CT examination. Their CT findings were highly suspicious of COVID-19 pneumonia. On the same day, the RT-PCR for throat swab samples was detected. His younger granddaughter (case 6) went to Shenzhen children’s hospital for chest CT examination without abnormality, and the RT-PCR for throat swab samples was performed.

The results of RT-PCR about the patient, his wife, his son, and his granddaughter were all positive. They were immediately transferred to the designated hospital for treatment. The results of RT-PCR about his daughter-in-law and little granddaughter were negative and asked to be

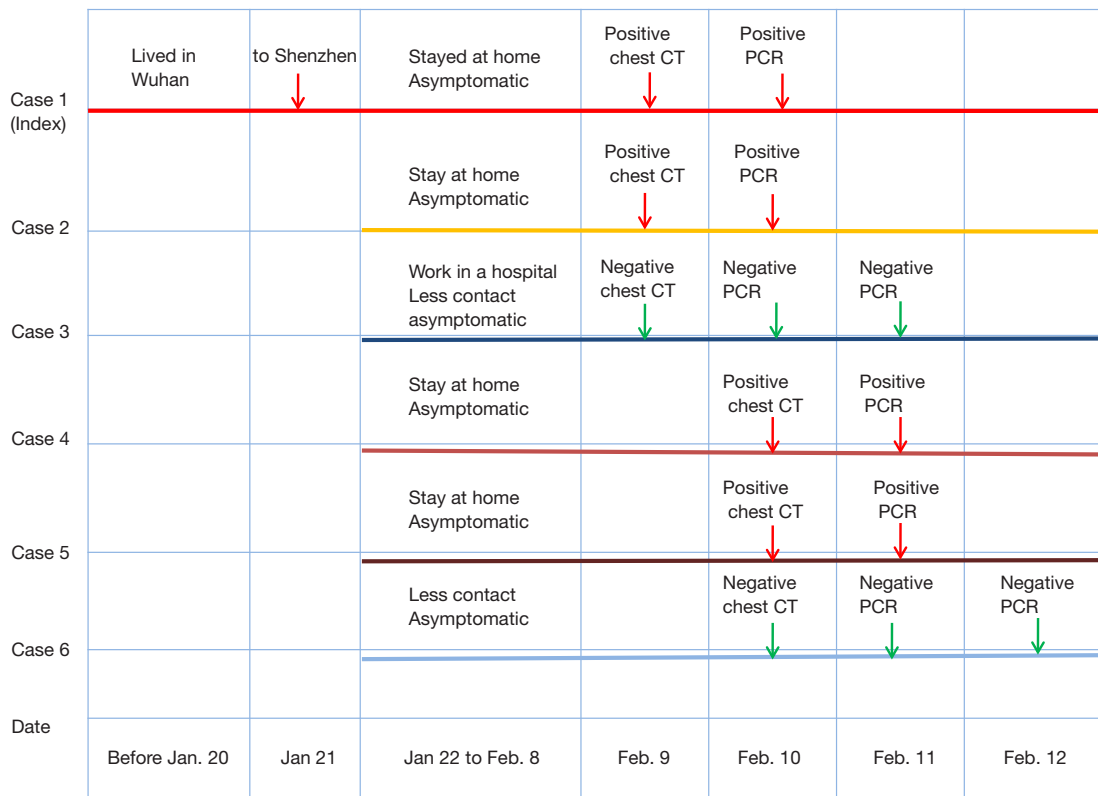


Figure 1 Timeline of family cluster of asymptomatic infections with COVID-19.

isolated at home (Figure 1).

Centers for Disease Control and Prevention(CDC) and the streets where these cases it is located were asked to take more strict prevention, control and isolation measures and medical observation for those who may had contact with the family members and the environment, and no new suspected case has been found until March 8.

Chest CT findings of the cases

Case 1, male, 69 years old. Normal white blood cell count, lymphocyte count and C-reactive protein. Chest CT showed the upper and lower lobes of the right lung scattered small, thin, ground-glass opacity with unclear boundary. Multiple linear shadows were seen in the right lung, and the lesion range was less than 10%. According to the literature report (7,8), the image manifestations of the lesion were in the dissipation period (Figure 2).

Case 2, male, 49 years old, white blood cell and lymphocyte count and C-reactive protein were normal. Chest CT showed that the lower lobes of both lungs

had scattered patchy ground-glass opacity with unclear boundary. A few linear shadows were seen in the lower lobes, and the lesion range was about 10%. According to the literature report, the image manifestation of the lesion belonged to the dissipation period (Figure 3).

Case 3, female, 49 years old. Normal white blood cell and lymphocyte count, normal C-reactive protein. No viral pneumonia on chest CT (Figure 4).

Case 4, female, 69 years old. Normal leukocyte and lymphocyte count as well as normal C-reactive protein. Chest CT showed that bilateral lung mottled ground-glass opacity with unclear boundary and multiple linear shadows. The lesion range was about 15%. According to the literature report, the image manifestation of the lesion belonged to the dissipation period (Figure 5).

Case 5, female, 16 years old. Normal white blood cell and lymphocyte count, and normal C-reactive protein. Chest CT showed typical paving stone like changes with limited scattered high-density shadows in the sub pleural of the lower lobe of both lungs, accompanied by the thickening of the interlobular septum. According to the literature report,

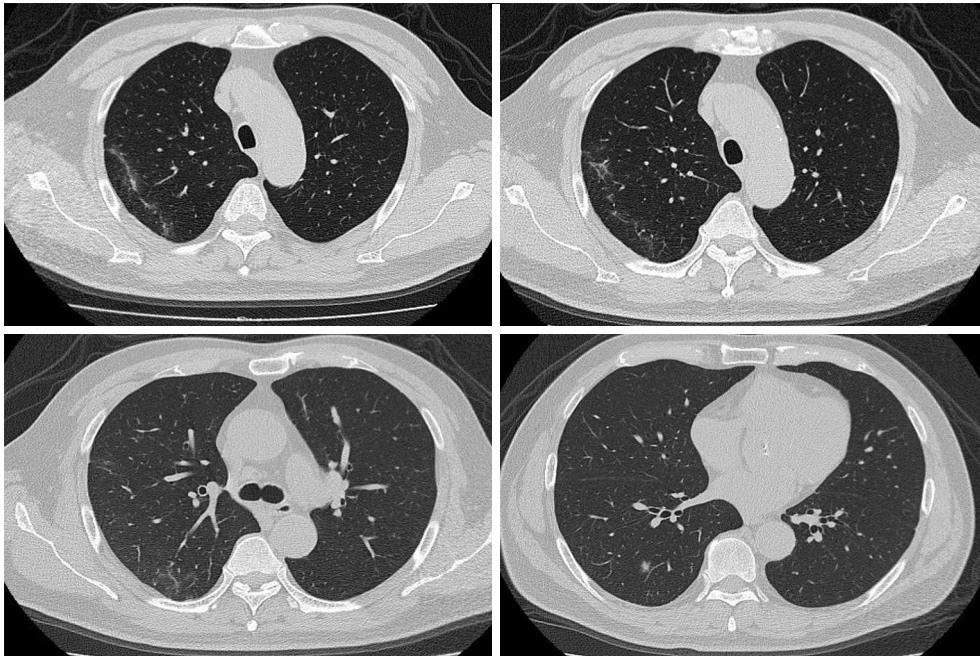


Figure 2 Case 1, a 69-year-old male, upper and lower lobes of the right lung show scattered small thin ground-glass opacity, unclear boundary, and multiple small linear shadows.

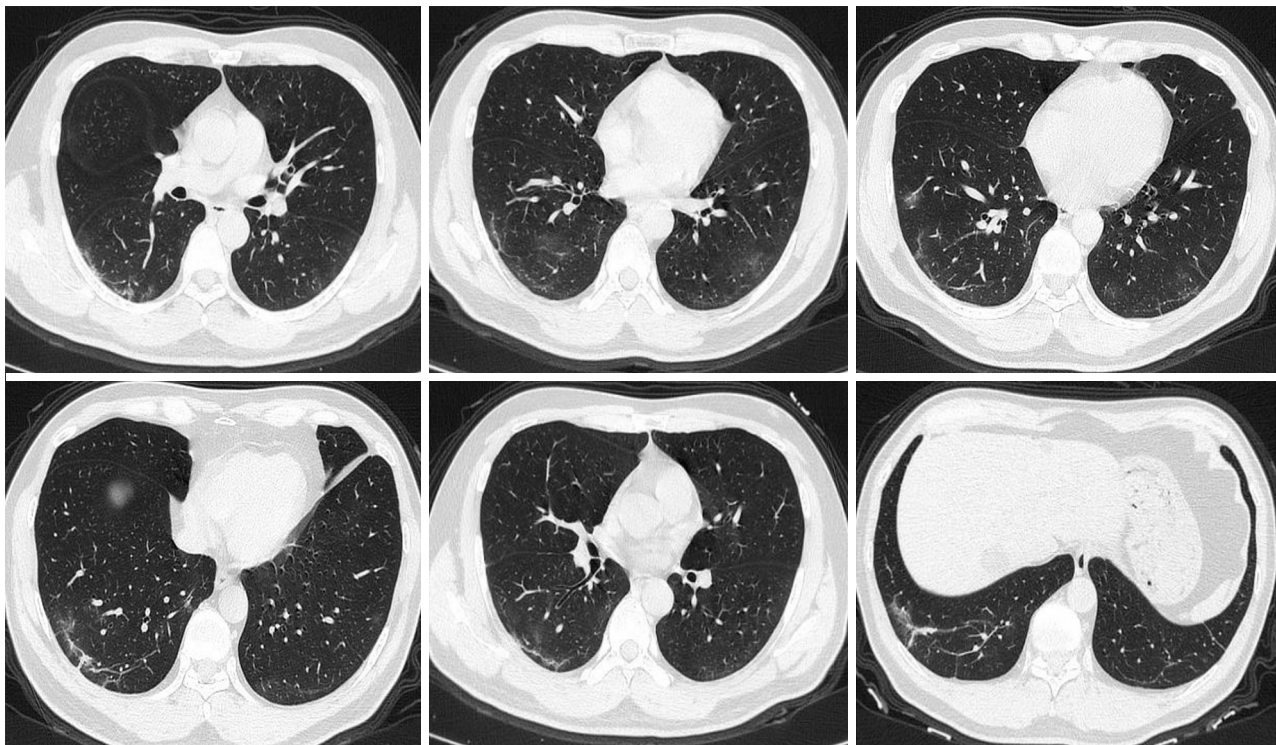


Figure 3 Case 2, a 49 years old male, CT shows patchy ground-glass opacity in the lower lobes of both lungs, with unclear boundary and multiple linear shadows.

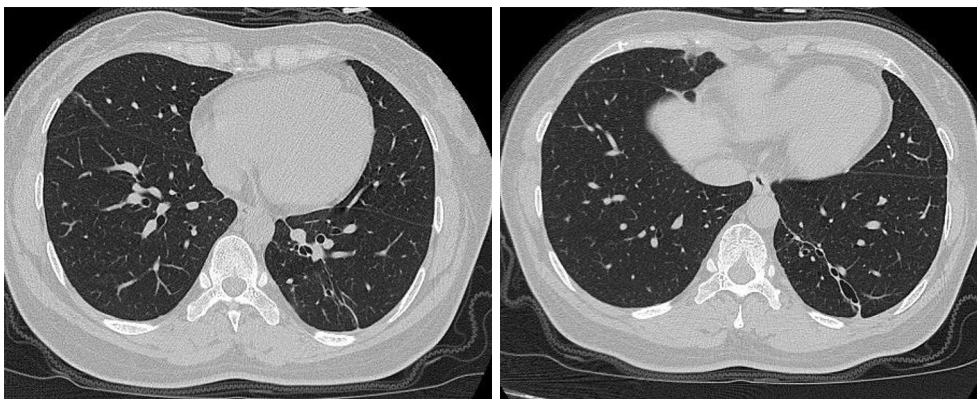


Figure 4 Case 3, a 49 years old female, chest CT shows bronchiectasis with linear shadow around at right middle lobe and left lower lobe of the lung. No viral pneumonia.

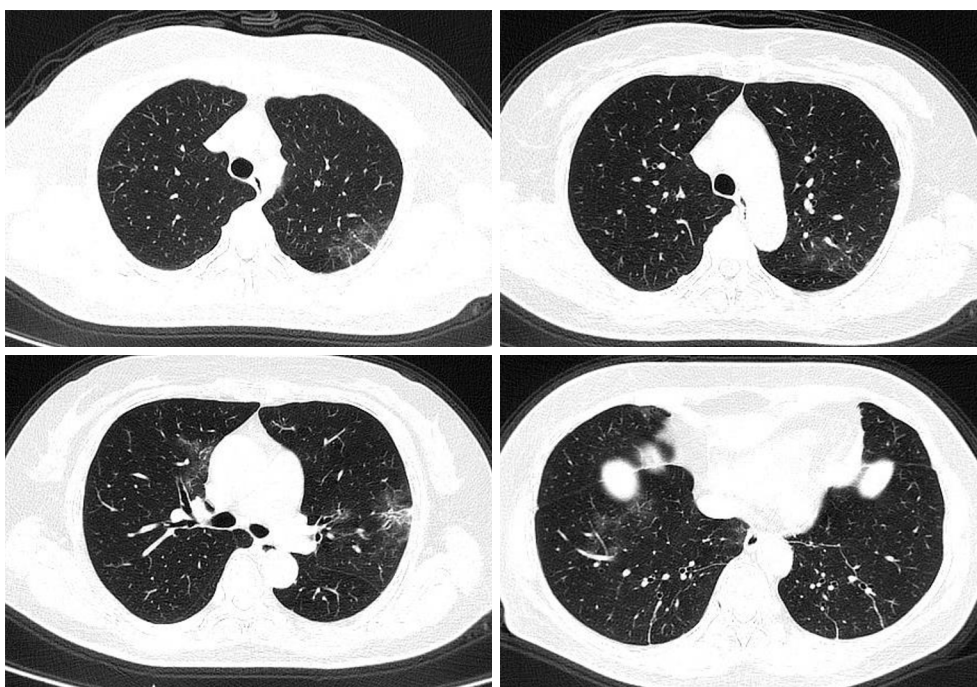


Figure 5 Case 4, a 69 years old female, chest CT shows that bilateral lungs mottled ground-glass opacity with unclear boundary and multiple linear shadows.

the imaging manifestation of this case belonged to the consolidation stage (*Figure 6*).

Case 6, female, 2 years old. No abnormality found on chest CT (*Figure 7*).

Discussion

This is a report of a group of asymptomatic infections with

family aggregation. Case 1 came from Wuhan. He has been relatively 'isolated' for 20 days at home without clinical symptoms. As the local disease prevention and control policy request, the chest CT of his son was first conducted and revealed findings consistent with COVID pneumonia. Isolation measures were immediately taken, his family members were asked to take chest CT and RT-PCR testing. The chest CT manifestations of 4 infected patients were



Figure 6 Case 5, a 16 years old female, chest CT shows patchy density under the pleura of the lower lobes of both lungs, showing typical paving stone like change. Thickening of interlobular septa is also noted.

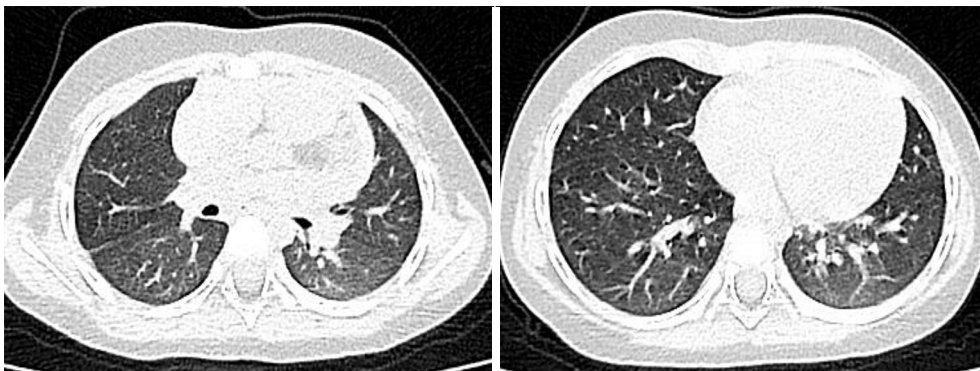


Figure 7 Case 6, a 2 years old girl, no abnormality on chest CT.

different in this group, which may be due to the different timings of virus infection and different responses of the body to the virus. In case 1, the lung lesions were small in size, low in density, and fibrosis was seen. The inflammation in the lung was in the dissipation and absorption stage. This patient might be the first one who had contact with the virus. In case 5, the density of lung lesions was relatively high, and it was in the consolidation stage. It may be due to the shorter exposure

time of viruses and the different immunity of the body to the virus for this case. This case series highlights the importance of proactive measures to identify COVID-19 infection among asymptomatic subjects with exposure history.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/qims.2020.04.15>). The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this study and any accompanying images.

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