of 3% hypertonic saline was inhaled through a mask with oxygen at a flow rate of 6 L/min for 20 min or until the sputum was produced) was positive for viral RNA.

Our second case was a 42-year-old woman who was admitted to our hospital on Jan 27, 2020, because of self-reported fever for the previous 4 days. On admission, her white blood cell count was $4{\cdot}01 \times 10^9$/L, lymphocyte count was $0{\cdot}71 \times 10^9$/L, and C-reactive protein level was 2·58 mg/L. Lung CT showed scattered inflammation in both lungs and lesions that were primarily distributed along the pleura (appendix pp 1–2). On Jan 28, viral RNA was detected in a throat swab, confirming a mild case of COVID-19. Her fever subsided the day after treatment with oxygen, lopinavir–ritonavir, and moxifloxacin, and her symptoms gradually resolved. After four follow-up lung CT scans, her lungs showed lesion resorption and improvement (appendix pp 1–2). Beginning Feb 10, three consecutive throat swabs (>24 h intervals) and one anal swab tested negative for viral RNA. On Feb 21, we induced 3 mL of sputum, as described before for our first case, and viral RNA was detected.

Sputum induction is a safe and simple non-invasive method for detecting various lung diseases.[3] Moreover, the risk of medical staff exposure to COVID-19 is lower with sputum induction than with nasal or throat swabs and bronchoalveolar lavage methods. Here we showed sputum induction might be more helpful than throat swabs for the detection of SARS-CoV-2 RNA in convalescent patients; to confirm our findings, more patients should be tested using this method to further test its viability for clinical application. Our study also showed that patients with COVID-19 might be contagious despite being clinically cured and having multiple negative throat swabs. To reduce the risk of disease spread, viral RNA tests of induced sputum—not throat swabs—should be assessed as a criterion for releasing COVID-19 patients.

We declare no competing interests. Written informed consent was obtained from the patients. We thank Prof Liehua Deng and Prof Dongming Li who were involved in the diagnosis and treatment of COVID-19. We also thank the patients.

*Huanqin Han, Qingfeng Luo, Fan Mo, Lieming Long, Weiqiang Zheng
huanqinhan@126.com

Infectious Diseases Center, Affiliated Hospital of Guangdong Medical University, Zhanjiang, Guangdong 524001, China

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See Online for appendix

Viral dynamics in mild and severe cases of COVID-19

Coronavirus disease 2019 (COVID-19) is a new pandemic disease. We previously reported that the viral load of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) peaks within the first week of disease onset.[1,2] Findings from Feb, 2020, indicated that the clinical spectrum of this disease can be very heterogeneous.[3] Here, we report the viral RNA shedding patterns observed in patients with mild and severe COVID-19.

76 patients admitted to the First Affiliated Hospital of Nanchang University (Nanchang, China) from Jan 21 to Feb 4, 2020, were included in the study. All patients were confirmed to have COVID-19 at the time of admission by RT-PCR. The viral loads of their nasopharyngeal swab samples were estimated with the ΔCt method ($Ct_{sample} - Ct_{ref}$). Patients who had any of the following features at the time of, or after, admission were classified as severe cases: (1) respiratory distress (≥30 breaths per min); (2) oxygen saturation at rest ≤93%; (3) ratio of partial pressure of arterial oxygen to fractional concentration of oxygen inspired air ≤300 mm Hg; or (4) severe disease complications (eg, respiratory failure, requirement of mechanical ventilation, septic shock, or non-respiratory organ failure). 46 (61%) individuals were classified as mild cases and 30 (39%) were classified as severe cases. The basic demographic data and initial clinical symptoms of these patients are shown in the appendix. Parameters did not differ significantly between the groups, except that patients in the severe group were significantly older than those in the mild group, as expected.[4] No patient died from the infection. 23 (77%) of 30 severe cases received intensive care unit (ICU) treatment, whereas none of the mild cases required ICU treatment.

We noted that the ΔCt values of severe cases were significantly lower than those of mild cases at the time of admission (appendix). Nasopharyngeal swabs from both the left and right nasal cavities of the same patient were kept in a sample collection tube containing 3 mL of standard viral transport medium. All samples were collected according to WHO guidelines.[5] The mean viral load of severe cases was around 60 times higher than that of mild cases, suggesting that higher viral loads might be associated with severe clinical outcomes. We further stratified these data according to the day of disease onset at the time of sampling. The ΔCt values of severe cases remained significantly lower for the first 12 days after onset than those of corresponding mild cases (figure A). We also studied serial samples from 21 mild and ten severe cases (figure B). Mild cases were found to have an early viral clearance, with 90% of these patients repeatedly testing negative on RT-PCR by day 10 post-onset. By contrast, all severe cases still tested positive at or beyond day 10 post-onset. Overall, our data indicate that, similar to SARS in 2002–03,[6]

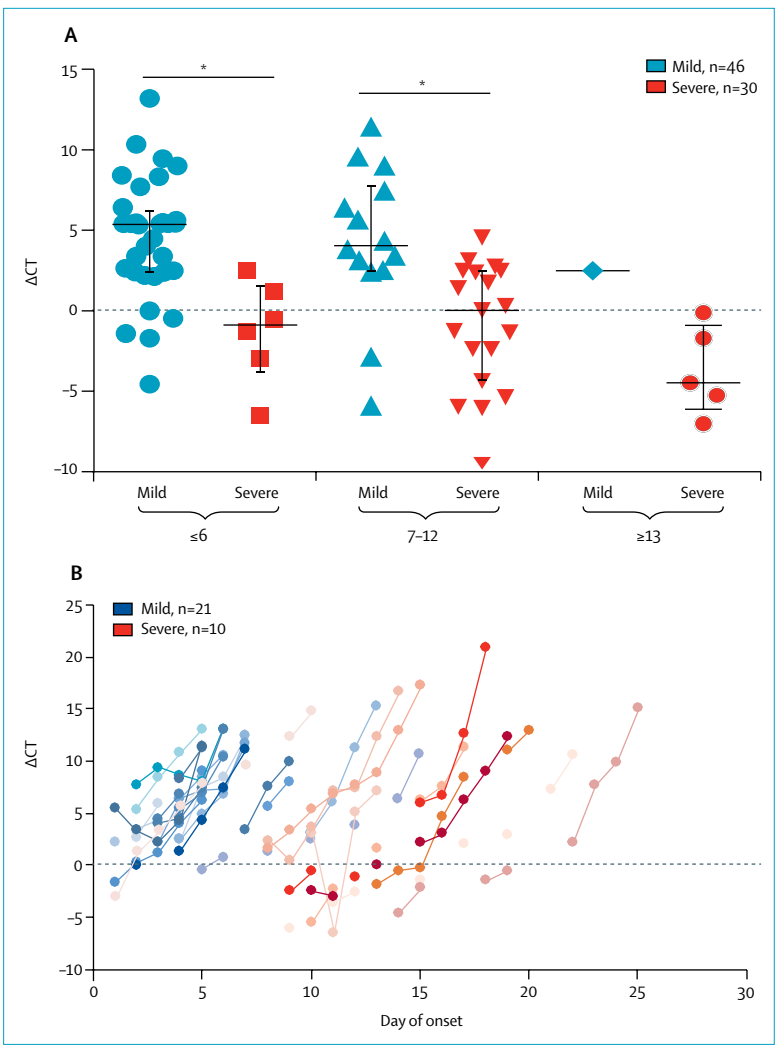

***Figure*: Viral dynamics in patients with mild and severe COVID-19**
(A) ΔCT values (Ct_{sample}-Ct_{ref}) from patients with mild and severe COVID-19 at different stages of disease onset. Median, quartile 1, and quartile 3 are shown. (B) ΔCT values of serial samples from patients with mild and severe COVID-19. COVID-19=coronavirus disease 2019. *p<0·005.

patients with severe COVID-19 tend to have a high viral load and a long virus-shedding period. This finding suggests that the viral load of SARS-CoV-2 might be a useful marker for assessing disease severity and prognosis.

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*Yang Liu, Li-Meng Yan, Lagen Wan, Tian-Xin Xiang, Aiping Le, Jia-Ming Liu, Malik Peiris, *Leo L M Poon, *Wei Zhang*
llmpoon@hku.hk; zhangweiliuxin@163.com

Department of Clinical Microbiology (YL), Department of Infectious Disease (T-XX), Department of Blood Transfusion (AL), Department of Orthopedic Surgery (J-ML), and Department of Respiration (WZ), The First Affiliated Hospital of Nanchang University, Nanchang, Jiangxi 330006, China; and School of Public Health, LKS Faculty of Medicine, The University of Hong Kong, Hong Kong Special Administrative Region, China (L-MY, MP, LLMP)

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The first COVID-19 case in Afghanistan acquired from Iran

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The outbreak of coronavirus disease 2019 (COVID-19) has now spread to over 100 countries with more than 100 000 laboratory-confirmed cases worldwide.[1] Here we describe the first case of COVID-19 in Afghanistan acquired from Iran.

A 35-year-old male Afghan shopkeeper visited Qom, Iran, for 1 week beginning Feb 9, 2020. In Iran, he had contact with employees from the shoe company that supplied his shop. He returned to his home in Herat, Afghanistan, by car on Feb 15, 2020, where he spent time with his family and friends without any precautions. On Feb 16, his symptoms began with fever, headache, cough, and dyspnoea. 5 days later, he felt increased concern and decided to visit a private clinic. At the private clinic, he was suspected of COVID-19 as he had recently returned from Iran, where the COVID-19 epidemic has intensified. The patient was referred to the governmental hospital to further investigate COVID-19 disease.

On the day of admission, Feb 22, 2020, the patient reported headache and appeared stressed. A physical examination showed no fever, a pulse of 85 beats per min,