



Severe Acute Respiratory Syndrome Coronavirus 2 Detection in the Radiology Department of Hospitals in Wuhan, China

Yumeng Tang, MMed^{1*}, Ziqiao Lei, MD^{2*},
Sheng Liu, MSc¹, Jing Li, PhD¹,
Shuguang Xie, MSc¹, Yantao Niu, MD³,
Lijun Tang, PhD¹

¹Hubei Provincial Center for Disease Control and Prevention, Wuhan, China; ²Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China; ³Beijing Tongren Hospital, Capital Medical University, Beijing, China

Dear Editor,

We have read the article by Chen et al. (1) published in the Korean Journal of Radiology with great interest concerning infection control and management strategy for coronavirus disease (COVID-19) in the department of radiology. Their valuable experiences provide important insights for those countries that are still fighting against COVID-19. Actually, at the beginning of the COVID-19 outbreak in Wuhan, we had initially attempted to assess the environment in the radiology department of hospitals in Wuhan. In this letter, we would like to report our findings

Received: June 16, 2020 **Revised:** June 16, 2020

Accepted: June 26, 2020

This work was supported by the National Key Research and Development Project (2020YFC0845600) and the Ministry of Science and Technology of the People's Republic of China (2017FY101200-15).

*These authors contributed equally to this work.

Corresponding author: Lijun Tang, PhD, Hubei Provincial Center for Disease Control and Prevention, No.35, Zhuodaoquan North Road, Hongshan District, Wuhan 430079, China.

• E-mail: lijuntang1963@163.com

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

regarding virus detection and observations on disinfection measures inside computed tomography (CT) suites.

We conducted environmental sampling in four CT rooms of two hospitals in Wuhan on February 1, 2020 and investigated their practices of disinfection. Three rooms (A, B, and C) were from a general hospital, and one (D) was from a specialty hospital of infectious diseases. Samples were collected 2 hours after routine cleaning with sterile pre-moistened swabs. A total of 200 environmental samples (50 swabs for each CT room) were collected from environmental surfaces and radiologists' personal protective equipment.

Real-time reverse-transcriptase polymerase chain reaction (RT-PCR) assay was performed using the AgPath-ID One-Step RT-PCR kit (Life Technologies). Two target genes, including the open reading frame lab and nucleocapsid protein, were simultaneously amplified and tested (2). Positive, indeterminate, and negative results were defined by a cycle threshold value of < 37, 37.0–39.9, and ≥ 40, respectively.

Table 1 shows the basic information of the four sites and the possible contaminated locations by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Six of 200 (3%) swabs were positive for the SARS-CoV-2 nucleic acid. All positive samples were from the general hospital. Positive samples were found both in CT and console rooms. Four of 200 (2%) samples showed indeterminate reactions, three from the general hospital and one from the specialty hospital.

Disinfection practices of the two hospitals were different. For sites A, B, and C, CT rooms were equipped with the Medical Plasma Air Disinfector (/PB600D, Shinva). Meanwhile, floors were cleaned using disinfectants (chlorine dioxide and sodium hypochlorite) thrice a day (8:00, 12:00, and 17:30). Surfaces of the equipment, CT bed, table-board, and four walls were wiped with disinfectants (sodium trichloroisocyanurate). In addition, frequently touched areas in the console room were cleaned with 75% (ethyl or isopropyl) alcohol. At site D, disinfection was performed using stationary germicidal ultraviolet disinfection lamps for 50 minutes according to diagnostic batches (batches of 20 patients each), and hydrogen peroxide solution was sprayed on surfaces and floors at 22:00.

The general hospital had setup triage stations and

Table 1. Characteristics of Sampled Sites and Possible Contaminated Sites for Presence of SARS-CoV-2

Site	Patients Type	Complete Isolation between Radiologists and Patients		Patients Number between Sampling and Routine Cleaning	Nucleic Acid Detection of Patients		Possible Contaminated Zone	Location of SARS-CoV-2 RNA	
		Corridor	Scan Room		Confirmed COVID-19	Non COVID-19		Positive	Indeterminate
A	Febrile patients	Yes	No	7	7	0	Scan room	Middle of CT bed, handrail of CT bed	Inner surface of observation window (patient side), air outlet
							Console room	Console table, shoe soles of radiologist	Shoe soles of radiologist
B	Emergency patients	No	No	19	11	8	Scan room	Internal aperture of CT detector	-
							Console room	Floor (junction of inside and outside)	-
C	General patients	Yes	No	8	0	8	-	-	-
D	COVID-19 inpatients	Yes	Yes	10	10	0	Scan room	-	End of CT bed

COVID-19 = coronavirus disease, CT = computed tomography, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2

assigned three CT rooms (A, B, and C) for different patients. At sites A and B, both the scan room for patients and the console room for radiologists had positive-testing samples. It might be because radiologists were not completely isolated from patients in the scan room and contaminated the console room by moving in and out. At site C, all samples were negative, probably because all examinees were non-COVID-19 patients owing to the triage process. At site D, the console room had no positive samples. This is probably because radiologists were completely isolated from patients both in the corridor and in the scan room, making the console room relatively uncontaminated.

The possible contamination locations indicated that the viruses can deposit on surfaces within the room, including floors, walls, equipment, and even the air outlet. These findings are consistent with a recent study in which swabs taken from air exhaust outlets tested positive, suggesting that virus droplets may be displaced by airflows and deposited on equipment, such as vents (3). Therefore, we should be vigilant about the fact that the environment of the radiology department might be a potential medium of transmission.

Strict adherence to environmental and hand hygiene is a priority. Additionally, the setup of a triage station might decrease the risk of cross-infection inside CT suites. Moreover, radiologists operating in the console

room should be isolated from patients completely. Finally, radiologists must be well-informed of infection control protocols to be followed inside the CT suite in this epidemic situation. Considering the limitation of our findings, if the environment of radiology suites is assessed comprehensively, the following tips are provided: 1) besides surface sampling swabs, ambient air samples should also be collected; 2) to assess possible transmission risk, viruses should be cultured outside of the host to see whether they are viable and infectious or not.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Acknowledgments

We remember the sacrifice of all frontline medical workers who fought against COVID-19 in Wuhan.

ORCID iDs

Yumeng Tang
<http://orcid.org/0000-0003-4624-3588>
 Lijun Tang
<http://orcid.org/0000-0002-8512-3303>

REFERENCES

1. Chen Q, Zu ZY, Jiang MD, Lu L, Lu GM, Zhang LJ. Infection control and management strategy for COVID-19 in the radiology department: focusing on experiences from China. *Korean J Radiol* 2020;21:851-858
2. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA* 2020;323:1061-1069
3. Ong SWX, Tan YK, Chia PY, Lee TH, Ng OT, Wong MSY, et al. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *JAMA* 2020;323:1610-1612

Response

Qian Chen, MD^{1, 2}, Long Jiang Zhang, MD, PhD¹

¹Department of Medical Imaging, Jingling Hospital, Nanjing Medical University, Nanjing, China; ²Department of Radiology, Nanjing First Hospital, Nanjing Medical University, Nanjing, China

To the Editor,

We sincerely appreciate your comment concerning our recent article "Infection Control and Management Strategy for COVID-19 in the Radiology Department: Focusing on Experiences from China" (1).

Nosocomial transmission of coronavirus disease (COVID-19) has been reported in many healthcare facilities (2, 3). Transmission may occur via droplets, contact, fomite, and airborne routes (4, 5). We appreciate Tang et al.'s work on severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) detection in the radiology department. In their study, the possible contamination location within computed tomography (CT) rooms included floors, walls, equipment, and even the air outlet. These findings may help us learn the extent of environmental contamination and mode of transmission in CT rooms. Furthermore, environment samples collected from both CT and console rooms at sites A and B, where radiologists were incompletely isolated from patients in scan rooms, tested positive for SARS-CoV-2. However, at site D, where radiologists were completely isolated from patients, the console room had no positive findings. These results suggest that complete isolation should be implemented between CT rooms and console rooms. As mentioned in our review (1), we recommend that radiographers stay in console rooms during the examination procedure. However, complete isolation is difficult if

patients have trouble ambulating, and radiographers might need to provide some help. At this time, radiographers should pay special attention to ensure the patients' safety while protecting themselves.

We are grateful to the findings of Tang et al. and believe their comments will enrich current knowledge and consolidate our infection control procedures in the future.

ORCID iDs

Qian Chen

<https://orcid.org/0000-0002-5874-1317>

Long Jiang Zhang

<https://orcid.org/0000-0002-6664-7224>

REFERENCES

1. Chen Q, Zu ZY, Jiang MD, Lu L, Lu GM, Zhang LJ. Infection control and management strategy for COVID-19 in the radiology department: focusing on experiences from China. *Korean J Radiol* 2020;21:851-858
2. Wang X, Zhou Q, He Y, Liu L, Ma X, Wei X, et al. Nosocomial outbreak of COVID-19 pneumonia in Wuhan, China. *Eur Respir J* 2020;55:2000544
3. Rickman HM, Rampling T, Shaw K, Martinez-Garcia G, Hail L, Coen P, et al. Nosocomial transmission of COVID-19: a retrospective study of 66 hospital-acquired cases in a London teaching hospital. *Clin Infect Dis* 2020 Jun 20 [Epub]. <https://doi.org/10.1093/cid/ciaa816>
4. He X, Lau EHY, Wu P, Deng X, Wang J, Hao X, et al. Temporal dynamics in viral shedding and transmissibility of COVID-19. *Nat Med* 2020;26:672-675
5. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med* 2020;382:1564-1567