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LETTER TO THE EDITOR

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Recurrent presence of SARS-CoV-2 RNA in a 33-year-old man

To the Editor,

Many studies have reported the potential human-to-human transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1,2] However, the transmission patterns and etiology in patients with repeated SARS-CoV-2 RNA detection remain unclear. This article describes a retrospective analysis involving

TABLE 1 Patient history and test results

Days after onset	Date	Hospital[a]	Isolation[a]	Home[a]	RT-PCR, Ct[b]	Antibodies[c]		CT scan
						Ab	IgM	
1	25-Jan			Home				
8	1-Feb	Admitted						
9	2-Feb				21.74, 23.97			GGO
27	20-Feb				40, 40			
28	21-Feb	Discharge	Observation					
41	5-Mar		Observation		38.83, 35.45			
42	6-Mar	Admitted						GGO
43	7-Mar					24.78		
52	16-Mar					77.20	1.08	GGO
55	19-Mar	Discharge	Observation		40, 40			
74	7-Apr		Observation					
75	8-Apr			Home				
92	25-Apr			Home	37.00, 31.00			
93	26-Apr	Admitted						
94	27-Apr					535.31	0.58	
109	12-May					287.56	0.46	
111	14-May				40, 40			GGO
112	15 May	Discharge	Observation					
128	1-Jun		Observation					
129	2-Jun			Home				
130	3-Jun		Observation					
137	10-Jun		Observation		32.40, 32.19			
138	11-Jun	Admitted				242.00	0.21	
142	15-Jun							

Abbreviations: GGO, ground glass opacity; IgM, immunoglobulin M; RT-PCR, reverse transcription polymerase chain reaction; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

[a]The patient stayed in the Infectious Disease Department until the RT-PCR test was negative for SARS-CoV-2. After discharge, the patient remained for 2 weeks in isolation in the Observation Department. Before release from this ward, the patient was tested by RT-PCR. When negative, the patient was allowed to go home. When positive, the patient was admitted again to the Infectious Disease Department. A negative RT-PCR result is requested of everyone before they return to work and study.

[b]Two target genes were simultaneously amplified in the RT-PCR. These were open reading frame 1ab (ORF1ab) and nucleocapsid protein (N).

[c]Antibodies were determined as total antibody (Ab) and IgM by chemiluminescence microparticle immunoassay. S/CO values ≥1.0 are considered to represent antibody positivity. S/CO values less than 1.0 are considered to be negative for SARS-CoV-2 antibody.

the repeated detection of SARS-CoV-2 RNA in a 33-year-old man (Table 1).

On 1 February 2020, a 33-year-old man presented at a fever clinic of The First People's Hospital of Jingmen (Hubei Province, China) with fever (37.3°C) and cough. The next day, he was admitted to the hospital. A test for SARS-CoV-2 RNA test by real-time reverse transcription polymerase chain reaction was positive (Ct = 21.74, 23.97). After treatment, he was discharged with negative RNA test results (Ct = 40, 40) and was isolated in the Observation Department on 21 February 2020.

Just before release from his 14-day quarantine on 5 March 2020, his throat swab RNA test was positive (Ct = 38.83, 35.45); therefore, he had to be admitted to the hospital again on 6 March. The S/CO (signal-to-cut off ratio) value of total antibody obtained by chemiluminescence microparticle immunoassay showed a positive value of 24.78 on 7 March and increased to a high S/CO value of 77.20 on 19 March.[3] The same day, he was discharged with a negative RNA test (Ct = 40, 40) and again placed in quarantine.

Surprisingly, his throat swab became positive again for SARS-CoV-2 RNA (Ct = 37, 31) on 25 April (screening before returning to work). He was requested to undergo hospital observation and treatment. The S/CO value of total antibody reached its peak level (535.31) on 27 April and declined to 285.76 by 12 May. After a period of antiviral therapy with oseltamivir, umifenovir, and interferon, his throat swab was negative (Ct = 40, 40). On 12 May, he was transferred from the Infectious Disease Department to the isolation ward for further observation.

On 10 June 2020, his throat swab was positive again (Ct = 32.4, 32.19). A duplicate sample was tested at the local Center for Disease Control and Prevention (CDC) and also gave a positive result (Ct = 34, 33). His lymphocyte subset results indicated normal immune function and were as follows: total T lymphocytes CD3+ 68.4%, CD3+ CD4 25.8%, CD3+ CD8 36.5%, CD3+ CD4/CD3+ CD8 1.2%, CD3− CD9 8.0%, and CD3− (CD16+/CD56+) 21.6%.

To prevent the potential spread of SARS-CoV-2 in the community, an epidemiological follow-up was conducted by the local CDC. His family members included his 62-year-old father and 58-year-old mother. The CDC collected throat swabs and blood samples from the parents. These were sent to the hospital and the CDC and were tested simultaneously for SARS-CoV-2 RNA and antibodies, respectively. Both tests were negative for both the father and the mother.

A positive SARS-CoV-2 RNA test does not necessarily mean that the virus is infectious and contagious.[4] After discharge from the Infectious Disease Department, the patient was kept in the Observation Department for 14 days. Thereafter, he went to his parents' home. Becoming infected in the Observation Department is very unlikely. Infection in the home can also be excluded because both parents had negative antibody and RNA tests. This indicated that the patient was likely not reinfected with SARS-CoV-2. In this particular case, the recurrent presence of SARS-CoV-2 RNA did not result in the transmission of the virus to the parents.

Antibodies were present in the total antibody test conducted on 7 March. Both the immunoglobulin M (IgM) and total antibody tests were positive on 16 March during the second episode. The total antibody test uses the receptor-binding protein of the virus as a coating antigen, and the test has high sensitivity and specificity. During the third and the fourth episodes, the total antibody test was positive but no IgM was detected. These results show that in this particular case antibodies did not prevent the recurrent infections, but they may have inhibited transmission.

Reasons for the repeated presence of SARS-CoV-2 RNA may arise from the biological characteristics of SARS-CoV-2 and might also be related to coexisting diseases.[5] It remains unknown whether SARS-CoV-2 antibody formation confers immunity; perhaps low titers of neutralizing antibody did not result in protective immunity to SARS-CoV-2. Another possible explanation for the repeated presence of SARS-CoV-2 RNA is inducible resistance to antiviral drugs. In an interview, the patient stated that he did not take antiviral drugs regularly after discharge from the hospital because he was afraid that his liver function would be injured as a side effect.

Studying a larger group of cases over a prolonged period should provide information on whether the presented case is exceptional or common, which could have implication for the properties of future vaccines.

CONFLICT OF INTERESTS

The author declares that there are no conflict of interests.

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this article.

KEYWORDS

immune responses, neutralization, pathogenesis, reinfection, SARS coronavirus, shedding, virus classification

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