

Covid Reinfection Versus Asymptomatic Carrier State

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Abstract:

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first discovered in China in December 2019, has been implicated in the current coronavirus disease 2019 (COVID-19) pandemic. Although much has been learned about the virus which peaked with the development of the vaccine, there is still a lot of unanswered questions.

Keywords: covid ; severe acute respiratory

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first discovered in China in December 2019, has been implicated in the current coronavirus disease 2019 (COVID-19) pandemic. Although much has been learned about the virus which peaked with the development of the vaccine, there is still a lot of unanswered questions. Maximum duration of positive SARS-CoV-2 real-time reverse transcriptase polymerase chain reaction (RT-PCR) from symptom onset may be up to 3 months [1], however it is not known if the continued detection of the viral genome implies prolonged infectivity or presence of a non-viable virus [2]. Most people with COVID-19 develop antibodies after resolution of acute infection [2]. The exact duration of these antibodies in the body is unknown, but some studies have shown that both memory T-cells and B-cells can persist up to 6 to 8 months after acute SARS-CoV-2 infection [3]. These SARS-CoV-2 antibodies may confer some immunity to the person after the acute infection and have been associated with protection against subsequent infection in nonhuman primates by the same viral strain during the early recovery phase [4]. In humans, however, it is unknown to what extent this immune response indicates a protective immunity to subsequent infection with SARS-CoV-2 [5]. Few cases of reinfection have been documented worldwide with varying symptom severity; the first case in the US was published in January 2021 (reinfection occurred in June 2020) [5]. None of the initial cases reported the presence of SARS-CoV-2 antibodies at the time of reinfection. We present a patient who tested positive to SARS-CoV-2 RT-PCR twice in 10 months (Table 1). At both times, she was asymptomatic and the second time, she had coexisting SARS-CoV-2 antibodies.

Case Presentation

A 39-year-old healthy female healthcare professional in New York City had severe myalgia, generalized body weakness, cough, and subjective fever (maximum axillary temperature 99.8F) in March of 2020. The patient was not tested initially because there was no documentation of fever $\geq 100F$ (which was part of the testing criteria for COVID-19 at that time), in addition to restriction of testing due to limited availability. Conservative management with analgesics and hydration was done and symptoms subsided after 7 days. One week later (April 2020), multiple family members became sick with COVID-like symptoms and had positive SARS-CoV-2 RT-PCR. At this time, patient's symptoms had resolved but she was required to screen for COVID-19 due to close household contact with positive cases. She tested positive for SARS-CoV-2 by PCR (Roche Cobas 6800) (Table 1). Routine COVID-19 antibody testing (Roche Cobas Elecsys) offered to hospital staff on a voluntary basis a month later was also positive. Four months later (September 2020) during routine annual employee health screening, her COVID-19 antibodies were rechecked and were still reactive. In January 2021, the patient was tested due to mandatory return-to-work screening required after out-of-state travel and was found to be positive by both PCR and antibody. At that time, patient was completely asymptomatic but was required to quarantine. Six days later, she repeated both tests in an urgent care facility at which time SARS-CoV-2 RNA PCR (Roche Cobas) was negative while the IgG antibodies (Abbott Alinity i) remained positive. A respiratory viral panel for SARS-CoV-2 RNA PCR and influenza A and B (Roche Cobas) done three weeks later as part of the prerequisites for clinical rotation in a different hospital was also negative.

Date	Reason for SARS-CoV-2 testing	SARS-CoV-2 testing done
March 18, 2020	Severe myalgia, generalized body weakness, cough, and subjective fever.	Testing not done because patient did not meet testing criteria at that time (fever < 100F). ¹
April 3, 2020	Multiple symptomatic family members tested positive for COVID-19.	SARS-CoV-2 RNA RT-PCR ² positive.
May 26, 2020	Voluntary SARS-CoV-2 antibody screening offered to hospital staff.	SARS-CoV-2 IgG ³ positive.
September 11, 2020	Annual employee health screening.	SARS-CoV-2 IgG ³ positive.
January 7, 2021	Mandatory return-to-work COVID testing after a week-long vacation out-of-state.	SARS-CoV-2 RNA RT-PCR ² positive. SARS-CoV-2 IgG ³ positive.
January 13, 2021	COVID PCR and antibody testing done in an Urgent Care.	SARS-CoV-2 RNA RT-PCR ² negative. SARS-CoV-2 IgG ⁴ positive.
February 9, 2021	Mandatory COVID screening for clinical rotation in another hospital.	SARS-CoV-2 RNA and Influenza A and B Qual NAAT ⁵ negative.

Table 1: Timeline for SARS-CoV-2 testing

Legend:

1. New York City Department of Health and Mental Hygiene. 2020 Advisory #8 COVID-19 Update for New York City <https://www1.nyc.gov/assets/doh/downloads/pdf/han/advisory/2020/covid-19-03202020.pdf>
2. COBAS-6800 (Roche)
3. Cobas Elecsys (Roche)
4. Alinity i (Abbott)
5. Cobas (Roche)

Discussion/Conclusion

Millions of cases of SARS-CoV-2 infection have occurred worldwide, however only a few cases of reinfection have been reported. The asymptomatic index case had antibodies at the time she re-tested positive for SARS-CoV-2 10 months after first testing positive. This may be a case of re-infection in which the presence of antibodies kept the patient symptom-free. Genomic sequencing for the virus was not done on both occasions, nor does she have a negative PCR test between April 2020 and January 2021. Therefore, it is unclear if she had been carrying viral particles in her nose for 10 months. It is also unclear if she was contagious, as detecting viral RNA after recovery does not mean that there is infectious virus present [1]. Also, the last two SARS-CoV-2 RNA PCR tests done were negative so it may be inferred that, similarly, she may have been negative after the first infection even though she was not rechecked.

In conclusion, this report raises some unanswered questions which include:

1. Does testing positive to SARS-CoV-2 PCR while asymptomatic and having antibodies mean that the person is infectious?
2. What is the duration and durability of protection from neutralizing SARS-CoV-2 antibodies? Should checking of antibodies include quantitative titers?
3. What is the maximum duration an individual can have detectable SARS-CoV-2 viral RNA after infection?

We hope that further research will address these questions soon. Meanwhile, we recommend that continued precautions should be taken by everyone until herd immunity to SARS-CoV-2 has been achieved.

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Declaration

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Consent for publication: Consent was obtained from the patient and de-identified data was used.

Conflict of interest: The authors have no conflict of interest to declare.

Authors' contributions: The first author drafted the article while the second author critically reviewed it.

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