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Case Report

False-positive for SARS-CoV-2 antigen test in a man with acute HIV infection

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ABSTRACT

Although rapid antigen tests for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is convenient, some articles have demonstrated their low sensitivity indicating false-negative results should always be considered. Here, we raise the issue of false-positive on rapid antigen tests for SARS-CoV-2 with the first case of acute HIV infection who repeatedly positive for the rapid antigen test. A 39-year-old man was admitted to our hospital complaining of high-grade fever, dry cough, general fatigue, and anorexia. The rapid antigen test performed on a nasopharyngeal swab sample was positive, therefore the patient was separated in an isolated room apart from the COVID-19 ward while awaiting the confirmatory RT-PCR result. However, the RT-PCR for SARS-CoV-2 performed on nasopharyngeal swabs was repeatedly negative (three times), while the antigen test was repeatedly positive (three times in total). This patient was eventually diagnosed with acute human immunodeficiency virus (HIV) infection based on a high titer of HIV-RNA and absence of plasma HIV-1/2 antibodies. Physicians should consider the possibility of false-positive results in addition to false-negative results when using a rapid antigen test for SARS-CoV-2, and keep in mind that nucleic acid amplification tests are needed to confirm the diagnosis.

1. Introduction

Recent reports have shown the unreliability of rapid antigen tests for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) due to their low sensitivity [1,2]. Scohy et al. [1] tested 148 nasopharyngeal swabs and reported that the overall sensitivity of the rapid antigen test (COVID-19 Ag Respi-Strip test, Coris Bio-Concept, Gembloux, Belgium) was 30.2% compared to a quantitative reverse transcription PCR (RT-qPCR) test. Another study of 160 SARS-CoV-2 positive respiratory samples confirmed by reverse transcription PCR (RT-PCR) showed that the sensitivity of the rapid antigen test (BIOCREDIT COVID-19 Ag, RapiGEN, Gyeonggi-do, South Korea) ranged from 11.1% to 45.7% [2]. These studies clearly indicate that false-negative results should always be considered when using rapid antigen tests. On the other hand, the possibility of false-positive results is rarely emphasized, although false-positive results are an important issue because they can lead to inappropriate patient care and infection control. Ogawa et al. [3] reported a case of 96-year-old woman who tested false-positive for SARS-CoV-2 with Lumipulse G SARS-CoV-2 Ag (Fujirebio, Tokyo, Japan) a quantitative antigen test, but her final diagnosis and the reason for the false-positive result were not specified. Herein, we report a case of a man with acute HIV infection who was initially misdiagnosed as having coronavirus disease 2019 (COVID-19) based on the results of a rapid SARS-CoV-2 antigen test.

1.1. Case report

A 39-year-old man visited a clinic complaining of one day history of high fever. A saliva tested negative for severe acute respiratory 2 (SARS-CoV-2) using real-time polymerase chain reaction (RT-PCR). Thereafter, his high fever continued, and he developed a dry cough, general fatigue, and anorexia, and was admitted to our

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Table 1
Summary of SARS-CoV-2 and HIV tests performed in this patient.

Days after symptom onset	SARS-CoV-2		HIV			
	RAT	PCR	Ag/Ab (IC)[a]	Ag/Ab (CLIA)[b]	Ab (WB)[c]	RNA (copies/mL)
1		(−)				
9	(+)	(−)				
10			(−)	(+)		
11	(+)	(−)				
13		(−)				
14	(+)				(−)	$>1.0 \times 10^7$

AbbreviationsAb, antibody; Ag, antigen; CLIA, chemiluminescent immunoassay; HIV, human immunodeficiency virus; IC, immunochromatography; PCR, polymerase chain reaction; RAT, rapid antigen test; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; WB, Western blot assay

[a] Rapid test detecting both HIV-1 p24 antigen and antibodies to HIV-1/2 (ESPLINE® HIV Ag/Ab, Fujirebio, Tokyo, Japan).

[b] Simultaneous detection of both HIV-1 p24 antigen and antibodies to HIV-1/2 (ARCHITECT® HIV Ag/Ab, Abbott Japan, Tokyo, Japan).

[c] Western blot assay (NEW LAV BLOT 1 and 2, Bio-Rad laboratories, Tokyo, Japan). NEW LAV BLOT 1 detects antibodies to HIV-1 proteins (P18/17, P24/25, P34/31, P40, P52/51, P55, P68/66, GP41, GP110/120, and GP160). NEW LAV BLOT 2 detects HIV-2 proteins (P16, P26, P34, P56, P68, GP36, GP105, and GP140). No band was observed for either test in this case.

hospital 9 days after the onset. A rapid antigen test (ESPLINE SARS-CoV-2, Fujirebio, Tokyo, Japan) performed on a nasopharyngeal swab sample was positive, while a chest-X ray and chest computed tomography showed no evidence of pneumonia. The patient was separated in an isolated room apart from the COVID-19 ward while awaiting the confirmatory RT-PCR result. However, the RT-PCR for SARS-CoV-2 performed on nasopharyngeal swabs was repeatedly negative (three times), while the antigen test was repeatedly positive (three times in total). As he was a gay man who had had sex with men, acute human immunodeficiency virus (HIV) infection was suspected and a rapid antigen/antibody test (ESPLINE® HIV Ag/Ab, Fujirebio, Tokyo, Japan), and chemiluminescent immunoassay (ARCHITECT® HIV Ag/Ab, Abbott Japan, Tokyo, Japan) were performed to test for HIV. Although the rapid antigen/antibody test was negative, the chemiluminescent immunoassay was positive. This patient was eventually diagnosed with acute HIV infection because of a high titer of HIV-RNA ($>1.0 \times 10^7$ copies/mL) and an absence of plasma HIV-1/2 antibodies on Western blot assay (NEW LAV BLOT 1 and 2, Bio-Rad laboratories, Tokyo, Japan). The details of test results were summarized in Table 1.

2. Discussion

As far as we are aware, this is the first case to be reported of false-positive results on a SARS-CoV-2 antigen test in an individual with HIV infection. According to the product document of ESPLINE SARS-CoV-2, the sensitivity and specificity of the test compared to RT-PCR are 66.7% (16/24) and 100%, respectively [4]. Similar to other antigen kits for SARS-CoV-2, this product was confirmed to have no cross-reactivity to influenza and other respiratory viruses; however, its cross-reactivity to HIV has not been tested. Therefore, further investigation is needed to clarify why the SARS-CoV-2 antigen test was positive in this patient, and whether this apprehensiveness is a general issue for SARS-CoV-2 antigen kits.

As the specimen that tested false-positive for SARS-CoV-2 was a nasopharyngeal swab, another question is whether HIV is present in the nasopharyngeal cavity. Although we were unable to find any reports investigating the presence of HIV in nasopharyngeal swabs, it is known that HIV can be detected in many kinds of body fluids, including saliva [5–7]. Therefore, it is theoretically possible for a nasopharyngeal swab to contain HIV, especially in the acute phase of infection when the viral load is high, as was seen in the present case.

Although rapid antigen testing is easy to perform, and provides a rapid result, physicians should consider the possibility of false-positive results in addition to false-negative results, and should diagnose COVID-19 using a nucleic acid amplification test.

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Ethical approval

Written informed consent was obtained from the patient for the publication.

Declaration of competing interest

The authors declare no conflicts of interest.

Authorship statement

All authors meet the ICMJE authorship criteria.

Author contributions

All authors participated in the management of this patient. KY, TK, MA, and MS collected clinical data. KY wrote the manuscript and TK, MA, MT, and JF supervised the concept and manuscript writing. All authors read and approved the final manuscript.

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