The SARS-CoV-2 Antibody Test to Identify the Infection Status of Dental Personnel

Akira Fukatsu, Osamu Tsuzukibashi, Mana Fuchigami, Chiaki Komine, Yoshimi Konishi, Yuki Ogura, Hiroko Omori, Hidenori Suzuki, Katsuhiro Asaka, Yoshinori Ono, and Masahiko Fukumoto

Division of Laboratory Medicine for Dentistry, Department of Oral Health Science, Nihon University School of Dentistry at Matsudo, Matsudo, Chiba 271–8587, Japan

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Abstract

Coronavirus disease 2019(COVID-19), caused by SARS-CoV-2, continues to spread worldwide. The PCR method is the main test for confirming the presence of SARS-CoV-2 infection. On the other hand, serological diagnostic methods using immunochromatography, which can detect virus-specific antibodies in serum in a shorter time than with PCR, are becoming popular. In this study, a SARS-CoV-2-specific IgG antibody test using immunochromatography was performed on 52 people who worked at the Nihon University Hospital, School of Dentistry at Matsudo (NUHSDM). No SARS-CoV-2-specific IgG antibody-positive individuals were found. In addition to expanding the inspection system for SARS-CoV-2 and examining further infection prevention measures, establishing measures to prevent further infection spread when an infected person is identified is urgently necessary.

Introduction

In December 2019, COVID-19 occurred in Wuhan City, Hubei Province, China, and the infection is spreading all over the world(1). In Japan as well, since the first case was confirmed in January 2020, the spread of this infection has continued rapidly, and the total number of people infected at the end of May was 16,884. However, the number of new infections per day was the highest at 720 people on April 11, and gradually decreased. The emergency declaration issued on April 7 was canceled on May 25. There is a concern about a second wave of infection in the future, and the Ministry of Health, Labor and Welfare has indicated a “new lifestyle” for infection prevention. Continued infection prevention measures against SARS-CoV-2 are required.

On March 15, *The New York Times* reported that dental hygienists have the highest risk of SARS-CoV-2 infection by occupation, followed by dental assistants and den-

tists. Thus, individuals working in a dental practice have a very high risk of SARS-CoV-2 infection. The main test sample for SARS-CoV-2 is a nasopharyngeal swab. However, saliva also contains SARS-CoV-2, and it has been reported that saliva contains a viral load that can be used as an alternative test sample for nasopharyngeal swabs (2). Therefore dental treatment, which cannot avoid saliva splashing, involves high risk for SARS-CoV-2 infection.

The main test for SARS-CoV-2 infection is viral gene detection with PCR. On the other hand, serological diagnostic methods using immunochromatography, which detects virus-specific antibodies in serum, which can confirm the history of SARS-CoV-2 infection in a simple and short time, are becoming popular.

Two types of SARS-CoV-2-specific antibodies, IgM and IgG, have been detected with immunochromatography. In cases in which about 10 days have passed since the onset of COVID-19, the high sensitivity and specificity of immunochromatography are useful as a test to supplement the PCR test(3, 4).

In the present study, we performed an IgG antibody

Correspondence to :

Akira Fukatsu

E-mail : fukatsu.akira@nihon-u.ac.jp

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Table 1. Questionnaire for infection control

The SARS-CoV-2 antibody test to identify infection status of dental personnel		
[1] ID:	[2] Age:	[3] Male • Female
[4] Occupation		
[5] To the dentist, where is the medical department?		
[6] Infection prevention measures		
1) Do you use goggles?	Yes	No
2) Do you use a face shield?	Yes	No
3) Do you use a protective apron?	Yes	No
4) Do you disinfect the oral cavity before treatment?	Yes	No
5) Do you use a rubber dam?	Yes	No
6) Do you use an extra-oral vacuum?	Yes	No
7) Do you use barrier tapes?	Yes	No

test against SARS-CoV-2 using immunochromatography with samples from staff at NUHSDM. Then, we investigated the infection status and preventive measures for SARS-CoV-2 at NUHSDM.

Subjects and Methods

Subjects

Fifty-two people working at NUHSDM were enrolled (22 males, 30 females, average age 39.4 years old).

Methods

The presence or absence of IgG antibody against SARS-CoV-2 was confirmed using the SARS-CoV-2 antibody test reagent kit IgG (Kurashiki Spinning Co., Ltd.). For this test, blood was collected from the fingertip using a blood sampling puncture instrument (Gentlett II; Sanwa Chemical Laboratory Co., Ltd.). Next, about 10 μ l of blood was added to the drop well of the test strip with a special pipette, and then two drops of the sample diluent were added to the drop well. The results were judged 15 minutes later.

Then, we conducted a seven-item questionnaire survey on SARS-CoV-2 infection prevention during dental treatment (Table 1).

This study was conducted with the approval of the dean after being examined by the Ethics Review Committee of Nihon University Dentistry at Matsudo (EC20-006).

Fig. 1. C:Control line T:Test line
The judgment was negative when the control line appeared red and the test line did not appear.

Results

SARS-CoV-2-specific IgG antibody test

As a result of the SARS-CoV-2-specific IgG antibody test using fingertip blood as a sample and immunochromatography, all 52 subjects were negative (Fig. 1).

Questionnaire results about infection prevention for SARS-CoV-2 at the time of medical treatment

Regarding the use of goggles, 94.2% of study participants used them and 5.8% did not. Regarding the use of face shields, 79.6% used them and 20.4% did not. Regarding the use of a protective apron, 82.6% used one and 17.4% did not. Regarding disinfection of the oral cavity before treatment, 71.1% performed disinfection and 28.9%

did not. Regarding the rubber dam moisture proof method, 18.6% used this method and 81.4% did not. Regarding an extra-oral vacuum, 62.2% used this and 37.8% did not. Regarding barrier tape, 60.4% used it and 39.6% did not.

Discussion

In December 2019, a patient with pneumonia due to an unknown pathogen was identified in Wuhan City, Hubei Province, China, and the pneumonia was later found to be due to SARS-CoV-2 infection. WHO named this infectious disease, caused by SARS-CoV-2, COVID-19. Due to the increasing number of SARS-CoV-2 infections worldwide, WHO took the view on March 11, 2020 that the spread of SARS-CoV-2 was a pandemic. In Japan, the infection has spread rapidly since the first infected person was confirmed in January. Under such circumstances, *The New York Times* of the United States reported on March 15 that dentistry was the occupation with the highest risk of SARS-CoV-2 infection. Furthermore, saliva also contains SARS-CoV-2, and it has been reported that saliva contains a viral load that can be used as an alternative test sample for nasopharyngeal swabs(2).

We performed a SARS-CoV-2-specific IgG antibody test on staff working at the NUHSDM, and confirmed the infection status of SARS-CoV-2. As a result, all 52 subjects were negative.

Since the spread of SARS-CoV-2 infection was reported, medical personnel at the NUHSDM have been required to wear proper personal protective equipment (PPE) and conduct online medical safety training sessions on PPE. Infection prevention measures have been thoroughly implemented, including restrictions on the chairs that can be used in the waiting room, use of barrier films on the units, securing distance by limiting the units used, thorough cleaning and disinfection, other infection prevention measures against environmental factors, temperature measurement of patients who come to the hospital, a survey questionnaire of the patient's physical condition, and hand disinfection. After declaration of the emergency situation, unnecessary and non-urgent treatments and treatments that generate aerosols have not been carried out, and the staff work system has been adjusted to prevent infections. The fact that no SARS-CoV-2-specific IgG antibody-positive person was identified at this time is considered to be due to the infection prevention measures currently being implemented.

As a result of the infection prevention questionnaire, the usage rates of goggles, face shields, aprons, and barrier tapes, which are recommended to reduce the spread of SARS-CoV-2(5), were 94%, 79.6%, 82.6%, and 60.4%, respectively. Because the use of PPE in dental practice is always recommended due to the high risk of infection from saliva or blood droplets, regularly providing accurate instructions on how to wear PPE is considered necessary. The rubber dam usage rate was 18.6%, extra-oral vacuum usage was 62.2%, and intraoral disinfection rate was 71.1%. However, rubber dam is not used in surgical treatment and periodontal disease treatment, and extra-oral vacuum is difficult to use for treating children and disabled people because it is loud and scary. Therefore, it is difficult to use and implement 100% due to differences in medical treatment contents and patient characteristics in each department. On the other hand, suppression of saliva scattering by using a rubber dam is possible(6), and use of an extra-oral vacuum will reduce the scattering of saliva and cutting dust and reduce the contamination in the clinic(7); their use is recommended. In addition, because SARS-CoV-2 is vulnerable to oxidation, disinfecting the oral cavity with 0.2% povidone iodine or 1% hydrogen peroxide solution before dental treatment suppresses the spread of the virus outside the oral cavity(8). Thus, raising awareness about improving the use of rubber dams and an extra-oral vacuum and improving the practice of oral disinfection are necessary.

Even after the emergency declaration is lifted, thorough infection prevention measures should not be changed. At present, the number of daily medical treatments and the contents of medical treatments are returning to normal. Deterioration of oral hygiene increases the infectivity of the virus, resulting in aggravation of diseases such as pneumonia(9). In addition, because Angiotensin-converting enzyme 2(ACE2), which is a receptor for SARS-CoV-2, is highly expressed in the oral mucosa(10), the observation that the oral cavity is easily infected with SARS-CoV-2 will further increase the interest in oral care. Thus, an increased risk of infection in dental practice cannot be ruled out.

Although there are concerns about a second and third wave of infection in the future, in addition to expanding the inspection system such as antibody testing against SARS-CoV-2 and examining further infection prevention measures, if an infected person is confirmed, measures to

prevent outbreaks are urgently needed.

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