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Note

Does the timing of saliva collection affect the diagnosis of SARS-CoV-2 infection?

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ABSTRACT

We evaluated the optimal timing of saliva sample collection to diagnose the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. We obtained 150 saliva samples at four specific time points from 13 patients with confirmed SARS-CoV-2 infection. The time points were (1) early morning (immediately after waking), (2) immediately after breakfast before tooth brushing, (3) 2 h after breakfast, and (4) before lunch. On the 2nd hospital day, patients collected saliva at the four time points by themselves. We collected samples at two time points, (1) and (3), from the 3rd hospital day to day 9 following symptom onset. In 52 samples collected at the four time points, there was no significant difference. Meanwhile, there was no significant difference in the positive proportion or the viral load between the two time points in both analyses by the day from symptom onset and by all samples. In this study, there was no difference in the positive proportions in saliva collected at various time points within 9 days after symptom onset. The timing of saliva collection was not affected by the diagnosis of SARS-CoV-2 infection.

The coronavirus disease 2019 (COVID-19) caused by severe acute respiratory coronavirus 2 (SARS-CoV-2), and it occurred in December 2019 in Wuhan, China [1]. SARS-CoV-2 is highly contagious and continues to spread worldwide. Nasopharyngeal swabs are the primary sampling methods used to detect SARS-CoV-2. However, swab sampling is invasive and can pose a risk of infection for healthcare workers. Researchers suggest that saliva collected within 9 days after symptom onset is a useful sample for the molecular diagnosis of COVID-19 [2]. The Ministry of Health, Labor and Welfare in Japan has allowed “PCR assay by saliva collected within 9 days after symptom onset [3].” Several studies have reported that the detection sensitivity of the test using saliva is comparable to that of nasopharyngeal swab specimen [2, 4]. The saliva collection procedure is non-invasive, easy to collect, and can reduce the risk of virus transmission to healthcare workers. Recently, some studies reported that the SARS-CoV-2 molecular test using the posterior oropharynx samples collected in the early morning showed high sensitivity [5]. Moreover, in SARS-CoV-2 molecular tests, one case report stated that saliva collected in the early morning is desirable in terms of detection capability [6]. Therefore, the timing of saliva collection may also affect the results of the SARS-CoV-2 molecular test. In this study, we evaluated the optimal timing of saliva collection for SARS-CoV-2 molecular tests.

We conducted an observational study of patients with COVID-19 admitted to Sapporo Medical University Hospital between August 2020 and March 2021. On admission, nasopharyngeal swabs were collected and tested using the SARS-CoV-2 molecular test to confirm the infection. The specific time points were defined as the time point 1: early morning (immediately after waking, before teeth brushing, mouth rinsing, and eating breakfast), time point 2: right after breakfast before tooth brushing, time point 3: 2 h after breakfast, and time point 4: just before lunch. On the 2nd hospital day, patients collected saliva at four specific time points by themselves. From the 3rd hospital day to day 9

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Saliva specimens were collected at four specific time points. Positive proportions of the SARS-CoV-2 molecular test on the 2nd hospital day. Time point 1: early morning (immediately after waking, before tooth brushing, mouth rinsing, and eating breakfast), time point 2: immediately after breakfast (before teeth brushing), time point 3: 2 h after breakfast, and time point 4: before lunch.
that saliva could be obtained at any time in the morning for a diagnosis of the SARS-CoV-2 infection. Our study has several limitations. Firstly, we compared four specific time points including early morning, before breakfast, 2 h after breakfast, and before lunch as the timing of saliva collection. In this study, we could not compare saliva samples collected at the time points of the afternoon. Secondly, we did not consider sample properties. One study reported that a high viscosity could make nucleic acid extraction difficult. Under these circumstances, this could lead to a reduction in the diagnostic accuracy of the SARS-CoV-2 molecular test [14]. In our study, there were differences in viscosity according to collection time in the same patients. We acknowledge that saliva may be collected by patients who are dehydrated and symptomatic. This occurs in about 10% of asymptomatic volunteers [15]. Therefore, the viscosity of saliva may affect the results of the SARS-CoV-2 molecular test. Therefore, appropriate sample collection for SARS-CoV-2 testing is needed to detect the virus and prevent its spread.

To conclude, there was no difference in the positive readings of the SARS-CoV-2 molecular test with reference to the timing of saliva collection, that is within 9 days after symptom onset.

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