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Comparison of Saliva and Midturbinate Swabs for Detection of SARS-COV-2

Study Provided by: Microbiology Spectrum

The U.S. Centers for Disease Control and Prevention (CDC) recommends the use of upper respiratory specimens, including but not limited to nasopharyngeal, midturbinate nasal, anterior nasal, and saliva specimens for the initial diagnosis of coronavirus disease 2019 (COVID-19). Midturbinate swabs (MTS) are sometimes used as an alternative to nasopharyngeal swabs (NPS) to reduce patient discomfort and occupational exposure to healthcare workers. They represent a less invasive alternative to the NPS and are inserted to a depth of about two centimeters. Compared to the swab-based collection, saliva is less invasive, more affordable, and can be self-collected with minimal or no supervision. This recent study explains the findings of a side-by-side comparison of the saliva and midturbinate swabs for the detection of the COVID-19 virus. Most existing studies only looked at detection sensitivity starting with the presymptomatic period. Therefore, research that conducts a direct comparison of MTS and saliva, including an assessment of sensitivity over time (starting during the presymptomatic period), is critical to identifying optimally sensitive methods for early detection and effective control of SARS-CoV-2 transmission.

The purpose of this study was to compare the sensitivity of MTS and saliva specimens for detecting SARS-CoV-2 by actively following close contacts of COVID-19 cases and collecting MTS and saliva samples for real-time reverse transcription PCR (RT-PCR) during their postexposure quarantine period.

Results:

Fifty-eight individuals with known close contact with an active COVID-19 case were enrolled in this study. Contacts provided a total of 200 saliva and MTS pairs. The number of days of sample collection per participant ranged from one to seven. Among the contacts, 14 (24%) had at least one positive sample, including 11 with both positive saliva and MTS samples throughout follow-up. One contact had only positive saliva on 3 out of 3 samples (on days -3, 0, and 1 post-symptom onset) and 2 had only positive MTS samples. One was positive on 2 of 2 swabs (on days 7 and 10) and another was positive on 1 of 5

swabs (day 21; negative on days 14, 17, 19, and 24). Most of the participants (91%) were unvaccinated at the time of their first sample collection. Two participants were infected with the alpha variant (B.1.1.7) while all the other positive participants were infected with earlier strains of SARS-CoV-2. Most of the positive participants (92.9%) were symptomatic, whereas only one (2.3%) participant from the test negative group reported symptoms. Symptomatic participants were enrolled at -3 to 14 days since symptom onset and gave samples for up to 24 days from onset of symptoms. Symptoms were mild across the follow-up period. One participant had an oral temperature $\geq$ 38°C at the time of sampling, three had temperatures $\geq$ 37.8°C, six had temperatures $\geq$ 37.5°C, and all of these were in the positive group. No other significant differences were identified between the positive and negative groups.

Conclusion:

Early in the course of infection, saliva was significantly more sensitive than midturbinate nasal swabs (MTS). It was found that the optimal performance of saliva was in the presymptomatic period and was more sensitive than MTS before symptom onset. Several studies have shown that presymptomatic transmission plays a more important role than symptomatic and asymptomatic transmission in the spread of SARS-CoV-2. Furthermore, saliva tended to have lower Ct values and higher viral load compared to MTS from the presymptomatic period through the first days after symptom onset. Together, these findings suggest that saliva may be the most effective method for detecting SARS-CoV-2 early during infection.

These findings have implications for improving public acceptance of COVID-19 testing, reducing the cost of mass COVID-19 screening, and improving the safety of health care workers who conduct testing. These findings are extremely important when considering large-scale screening of COVID-19 in schools and workplaces. In addition to its higher sensitivity in the early stage of the disease as demonstrated in our data, saliva has quite a few other advantages that make it an appealing screening tool. Saliva collection is less invasive and more acceptable to the general population. One of the barriers hindering COVID-19 testing is people's fear of nasal swabs due to misinformation. In addition, the discomfort brought by nasal swabs may reduce people's willingness to get tested regularly, especially among children. With the use of saliva, screening large groups with increased frequency may be more practicable. Saliva is less expensive than swab-based methods, especially if polled samples are used. It si estimated that using saliva saved more than $600,000 in comparison to using NPS when sampling 100,000 individuals and using a method that was more expensive than the SalivaDirect method used here. These cost savings are especially important in the context of low-resource settings.

Saliva collection is also safer for health care workers (HCWs). Amid the pandemic, one of the key concerns among HCWs is the occupational exposure to SARS-CoV-2 aerosols during some medical procedures. The collection of nasal swabs introduces such exposure via the close interaction between patients and HCWs and by patients' coughing and sneezing because of the procedures. In contrast, saliva is the only upper respiratory specimen suggested by the CDC that can be self-collected without supervision and, hence, protects HCWs from directly contacting the patients when the samples are being

collected. Given all these advantages of saliva compare to NPS, the findings further support the use of saliva for large-scale screening, especially of presymptomatic patients.

In conclusion, the use of saliva is preferable for testing presymptomatic populations. It is more acceptable to people, which reduces barriers to testing. It is also more cost-effective for individuals to collect their saliva rather than using highly trained professionals to collect NPS and/or MTS. Finally, self-collected saliva samples eliminate the exposure to aerosols produced by sneezing, coughing, and gagging of patients undergoing NPS/MTS.

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