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Practice Points

Experience of different upper respiratory tract sampling strategies for detection of COVID-19

G. Ye [a,1], Y. Li [a,1], M. Lu [b], S. Chen [b], Y. Luo [b], S. Wang [a], Y. Wang [b], X. Wang [b,c,*]

[a] *Department of Clinical Laboratory, Zhongnan Hospital of Wuhan University, Wuhan, 430072, China*
[b] *Department of Urology, Zhongnan Hospital of Wuhan University, Wuhan, 430072, China*
[c] *Center for Evidence-Based and Translational Medicine, Zhongnan Hospital of Wuhan University, Wuhan, 430072, China*

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COVID-19 is spreading rapidly around the world [1]. At present, the diagnosis of COVID-19 mainly depends on real-time RT-PCR assay of throat swabs [2]. However, the false negative rate of nucleic acid test for SARS-CoV-2 with throat swabs is high, and throat swabs are uncomfortable for patients, and may induce coughing. The lingual swab is convenient and may achieve the same effect. This study compares the differences between lingual swab and throat swab sampling results, and analyzes whether standardized sampling by the same nurse could improve the detection rate compared with sampling by several nurses.

To analyze the positive rates of throat swabs and lingual swabs to detect COVID-19, we conducted a cohort study of two groups of suspected patients at two COVID-19 fixed-point hospitals (Wuhan No.7 Hospital and Zhongnan Hospital of Wuhan University). Zhongnan Hospital is one of the largest hospitals in the area, and has admitted a large number of COVID-19 patients [3,4]. Two groups of consented patients were sampled using both sampling methods; all swabs were tested using a real-time reverse transcription-polymerase chain reaction (RT-PCR) assay for SARS-CoV-2. The first group contained 46 patients, who were from fever clinic of Wuhan No.7 Hospital (a COVID-19 fixed-point hospital). This group of patients was sampled by the same experienced, who used a standardized sampling method. Of these patients, 54.3% (25/46) were positive by RT-PCR; 54.3% (25/46) tested positive on throat swabs and 36.9% (17/46) were positive on lingual swabs; all patients with positive lingual swabs also had positive throat swabs. In another group, 45 patients from the fever clinic of Zhongnan Hospital of Wuhan University were also sampled by using both methods, but this group of patients was sampled by several nurses. 48.9% (22/45) were diagnosed with SARS-CoV-2 infection by RT-PCR. However this time 33.3% (15/45) tested positive on throat swabs and 35.6% (16/45) on lingual swabs; only 45.5% (10/22) of the positive patients were detected by both methods (Table 1).

In total, of these 91 patients, the positive rate of throat swabs (44.0%) was higher than that of lingual swabs (36.3%), but this difference may have been attributable to a single experienced nurse collecting all of the samples in the first group (54.3% VS 36.9%). This suggests that highly trained or experienced nurses may improve the diagnostic sensitivity with throat swabs.

Furthermore, two Venn diagrams used to describe the relationship between two sampling methods in two groups (Supplementary Figure) illustrate the greater consistency of sampling in the first group, in which all lingual swab-positive patients also had a positive throat swab. The Kappa value was also higher (0.6599 VS 0.4592) for patients from Wuhan No.7 Hospital, sampled by the same experienced nurse, than for patients from Zhongnan Hospital (sampling performed by several nurses) (Supplementary Table).

In conclusion, the positive rate of throat swabs is higher than that of lingual swabs for the detection of COVID-19; however, in our small study this difference was only seen

* Corresponding author. Address: Department of Urology, Zhongnan Hospital of Wuhan University, Wuhan, 430072, China.Tel.: +86 27-6781-3104.

E-mail address: wangxinghuan@whu.edu.cn (X. Wang).

[1] These authors contributed equally to this work.

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Table 1
Positive rate of two sampling methods for nucleic acid detection in two hospitals

	Throat swab positive cases/Total	Lingual swab positive cases/Total	Both positive cases/Total	Positive cases/Total	Both positive cases/Positive cases
Wuhan No.7 Hospital					
Cases (n)	25/46	17/46	17/46	25/46	17/25
Rate (%)	54.3	36.9	36.9	54.3	68.0
Zhongnan Hospital					
Cases (n)	15/45	16/45	10/45	22/45	10/22
Rate (%)	33.3	35.6	22.2	48.9	45.5
Wuhan No.7 Hospital & Zhongnan Hospital					
Cases (n)	40/91	33/91	27/91	47/91	27/47
Rate (%)	44.0	36.3	29.7	51.6	57.4

when swabs were collected by a single experienced nurse. When multiple nurses took samples, throat swabs had no obvious advantage over lingual swabs, and diagnostic sensitivity was improved by collection of samples from both sites. We believe that these observations should be of value to other centres establishing COVID-19 diagnostic programmes.

Conflict of interest statement

None declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jhin.2020.03.012.

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