



# Assessment of SARS-CoV-2 in the Cerumen of COVID-19-Positive Patients

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## Abstract

**Objective:** To evaluate the presence of SARS-CoV-2 virus in the cerumen of patients with COVID-19. **Methods:** A prospective study was conducted in a tertiary care pandemic hospital. Sixty COVID-19 patients with cerumen in their external auditory canals were included in the study. Swabs were taken from the external auditory canal of the patients by an experienced otolaryngologist with the test swab. Sampling was done by rotating the sample swab 360° 10 times in each external auditory canal for a total of 20 times. After collection, swabs were placed into 2 mL of the sterile viral transport medium (various manufacturers), then transported and tested as soon as possible after collection. **Results:** SARS-CoV-2 was not detected in the cerumen polymerase chain reaction (PCR) samples of any of the 60 patients with positive nasopharyngeal/oropharyngeal swabs. **Conclusion:** Cerumen cleaning is one of the most common procedures performed by otolaryngologists, and care should be taken during the procedure or due to the possibility of infection from the resulting contaminants. The cerumen contains the secretions of the glands in the external auditory canal and may contain certain pathogens that are actively found in the body. The presence of hepatitis B virus in the cerumen was examined and isolated in the cerumen. In our study, the presence of SARS-CoV-2 virus in the cerumen was evaluated in SARS-CoV-2 PCR-positive patients. SARS-CoV-2 virus was not detected in the cerumen samples of any of the patients.

## Keywords

SARS-CoV-2, COVID-19, cerumen, external auditory canal

## Introduction

SARS-CoV-2 is isolated as the cause of the pandemic that was primarily detected in Wuhan, China, and spread all over the world. The disease caused by SARS-CoV-2 is named COVID-19 by the World Health Organization.<sup>1</sup> The most frequent symptoms of COVID-19 are fever, cough, fatigue, and dyspnea.<sup>2</sup> The most common ENT symptoms are sore throat, headache, and olfactory dysfunction.<sup>3</sup> Since there have been no drugs and vaccines specific to COVID-19 yet, social distance, hygiene, and use of face masks are among the most recommended measures.<sup>4</sup> Cerumen is the most frequently encountered problem in ENT practice. Millions of patients visit the ENT clinic every year due to cerumen. Cerumen consists of desquamated corneocytes and the secretions of sebaceous and ceruminous glands in the external auditory canal. It includes various lipids and proteins. In addition, the hairs in the external auditory canal lead to glandular secretions.<sup>5</sup> In a study, hepatitis B virus (HBV) was detected in the cerumen.<sup>6</sup> Cleaning of cerumen requires close contact, so otolaryngologists should be

careful in the pandemic period. Besides, SARS-CoV-2 has been detected in blood, urine, nasopharynx, oropharynx, sputum, and feces, but no study has been conducted whether it is present in the cerumen. The purpose of the current study is to assess the presence of SARS-CoV-2 in the cerumen of patients with COVID-19.

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## Materials and Methods

A prospective study was conducted in a tertiary care pandemic hospital. Permission was obtained from the local ethics committee. Because this was the first study in the literature of this nature, and in order to conserve testing resources during the pandemic, a sample size of 60 patients was planned.

Participants were recruited from a population of newly diagnosed COVID-19 patients in whom the SARS-CoV-2 polymerase chain reaction (PCR) test was positive within a 24-hour period. Consecutive 825 patients were evaluated by bilateral ear examination until 60 patients were found for inclusion. Criteria for inclusion were the presence of cerumen bilaterally and no prior treatment for cerumen, as this was thought to potentially affect results. Patients with tympanic membrane perforation, who had a history of cerumen cleaning, and those with known chronic otitis history were excluded from the study.

### Sample Collection

Swabs were taken from the bilateral external auditory canal of the patients by an experienced otolaryngologist with the test swab. Sterile nylon, Dacron, or rayon swabs with flexible plastic shafts were used to collect the samples from patients. Sampling was made by rotating the sample swab 360° 10 times in each external auditory canal for a total of 20 times. No bleeding and discomfort occurred in any patient during sampling. After the sampling, an ear examination was performed, and it was confirmed that the sample swab touched the cerumen and there was no bleeding as it may affect the results. After collection, swabs were placed into 2 mL of the sterile viral transport medium (VTM; various manufacturers) which provides cerumen evaluation. Samples were transported and tested as soon as possible after collection.

### Real-Time Reverse Transcription PCR

RNA extraction from swab samples was performed using Biospeedy Viral Nucleic Acid Isolation Kit (Bioeksen), according to the manufacturer's instructions; swab samples in VTM were vortexed for 15 seconds and then 100  $\mu$ L sample was transferred to a 1.5-mL microcentrifuge tube containing 100  $\mu$ L viral nucleic acid extraction buffer supplied by the manufacturer. After vortexing once again, the tube was ready for PCR reaction. Detection of SARS-CoV2 in swab samples was performed by real-time reverse transcription PCR method targeting *RdRp* (RNA-dependent RNA polymerase) gene.

Real-time reverse transcription PCR was performed by using Bio-Speedy COVID-19 RT-qPCR Detection Kit (Bioeksen). A 20  $\mu$ L reaction contained 5  $\mu$ L of RNA, 5  $\mu$ L of Oligo Mix (RdRp gene for SARS-CoV-2 detection, Rnase P gene for internal control), and 10  $\mu$ L of 2 $\times$  Primer Script Mix containing Taq Polymerase, each deoxyribose triphosphates, reverse transcriptase, and ribonuclease inhibitor. Thermal cycling was performed at 45 °C for 10 minutes for reverse transcription,

followed by 95 °C for 3 minutes, and then 45 cycles of 95 °C for 5 seconds, 55 °C for 35 seconds in Rotor-Gene Q device (Qiagen). Cycle threshold (Ct) values of less than 40 were defined as positive.

## Results

The age of the patients was between 18 and 70 years old. Forty-three (71.7%) patients were male and 17 (28.3%) were female; 56.6% of the patients had positive signs in the chest computed tomography (CT), and 43.4% of patients had normal chest CT. Twenty (33.3%) patients of the group were hospitalized due to COVID-19. None of the patients was suffering from cerumen impaction nor hearing loss. SARS-CoV-2 was not detected in the cerumen PCR samples of any of the 60 patients with positive nasopharyngeal/oropharyngeal swabs.

## Discussion

COVID-19 disease caused by SARS-CoV-2 is a major health problem worldwide. The most effective methods for the prevention of this disease are social distance, use of masks, and hygiene because no therapeutic drug or vaccine has been discovered yet.<sup>4,7</sup> Other ways of transmission are suspected in the disease, which has been proven to spread from person to person.<sup>8</sup> The detection of SARS-CoV-2 in anal swab samples has drawn attention to the fecal–oral route.<sup>9</sup> Isolation of the virus in the blood has drawn attention to transmission via blood.<sup>10</sup>

Failure to detect the virus in semen analysis has led to the opinion that the transmission of the disease will not occur sexually.<sup>11</sup> It is known that the virus has eye symptoms and also the nasolacrimal system opens into the nose. However, in a study, tear was assessed but SARS-CoV-2 could not be detected.<sup>12</sup>

Since the cerumen contains the secretions of the glands in the external auditory canal, it may contain certain pathogens that are actively found in the body.

In a study performed in 2015 regarding the presence of HIV in the cerumen, HIV was not isolated in the cerumen.<sup>13</sup> In another study conducted in 2005, the presence of hepatitis C virus in the cerumen was examined and the virus could not be isolated in the cerumen.<sup>14</sup> In other studies, conducted in 2008 and 2011, the presence of HBV virus in the cerumen was examined and the virus was isolated in the cerumen. Otolaryngologists should be especially careful during cleaning the cerumen as there may be transmission via this way, and the contaminants generated after the treatment should be disposed via appropriate methods.<sup>6,15</sup>

It is known that the majority of cases are asymptomatic. These cases are an important cause of the transmission.<sup>16</sup> These cases may come to outpatient clinic due to cerumen impaction and cause transmission. Cleaning the cerumen requires close contact, and stimulation of Arnold's nerve can cause cough which leads to excess air droplets. On the other hand, cerumen may contain SARS-CoV-2. An otolaryngologist should be very careful. In our clinic, we use N95/FFP2 face mask for the

otolaryngologist and surgical masks for the patient during cerumen cleaning.

In the present study, the presence of SARS-CoV-2 virus in the cerumen was evaluated. Cerumen sampling was performed by swabbing from both external auditory canals of 60 patients with positive SARS-CoV-2 PCR, and the results were evaluated. SARS-CoV-2 virus was not detected in the cerumen samples of any of the patients.

Among the limitations of the study, the small number of patients can be considered. However, each PCR test is valuable under pandemic conditions, so we were able to use 60 tests in our study. Since the virus was highly infectious, the cerumen could not be excised and tested under the microscope. Swab sampling from the cerumen was done in the biosafety cabinet.

## Conclusion

Cerumen cleaning is one of the most common procedures performed by otolaryngologists, and care should be taken during the procedure or due to the possibility of infection from the resulting contaminants. In the present study, SARS-CoV-2 was not isolated in the cerumen but still precautions to be applied for pandemic rules such as social distance and use of face masks. Further studies will assure the information on this topic.


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## References

1. Mecham JC, Thomas OJ, Pirgousis P, Janus JR. Utility of tracheostomy in patients with COVID-19 and other special considerations [published online ahead of print May 5, 2020]. *Laryngoscope*. 2020. doi:10.1002/lary.28734
2. Zhai P, Ding Y, Wu X, Long J, Zhong Y, Li Y. The epidemiology, diagnosis and treatment of COVID-19. *Int J Antimicrob Agents*. 2020;55(5):105955. doi:10.1016/j.ijantimicag.2020.105955
3. El-Anwar MW, Elzayat S, Fouad YA. ENT manifestation in COVID-19 patients [published online ahead of print June 15, 2020]. *Auris Nasus Larynx*. 2020;S0385-8146(20)30146-2. doi:10.1016/j.anl.2020.06.003
4. Güner R, Hasanoğlu I, Aktaş F. COVID-19: prevention and control measures in community. *Turk J Med Sci*. 2020;50(SI-1):571-577. doi:10.3906/sag-2004-146
5. Guest JF, Greener MJ, Robinson AC, Smith AF. Impacted cerumen: composition, production, epidemiology and management. *QJM*. 2004;97(8):477-488. doi:10.1093/qjmed/hch082
6. Gholami-Parizad E, Taherikalani M, Mozaffar-Sabet NA, et al. Cerumen as a potential risk for transmission of hepatitis B virus. *Acta Microbiol Immunol Hung*. 2011;58(2):105-112. doi:10.1556/AMicr.58.2011.2.3
7. Eikenberry SE, Mancuso M, Iboi E, et al. To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. *Infect Dis Model*. 2020;5:293-308. doi:10.1016/j.idm.2020.04.001
8. Wei WE, Li Z, Chiew CJ, Yong SE, Toh MP, Lee VJ. Presymptomatic transmission of SARS-CoV-2—Singapore, January 23–March 16, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(14):411-415. doi:10.15585/mmwr.mm6914e1
9. Fan Q, Pan Y, Wu Q, et al. Anal swab findings in an infant with COVID-19. *Pediatr Investig*. 2020;4(1):48-50. doi:10.1002/ped4.12186
10. Peng L, Liu J, Xu W, et al. SARS-CoV-2 can be detected in urine, blood, anal swabs, and oropharyngeal swabs specimens [published online ahead of print April 24, 2020]. *J Med Virol*. 2020. doi:10.1002/jmv.25936
11. Guo L, Zhao S, Li W, et al. Absence of SARS-CoV-2 in semen of a COVID-19 patient cohort [published online ahead of print June 29, 2020]. *Andrology*. 2020. doi:10.1111/andr.12848
12. Seah IYJ, Anderson DE, Kang AEZ, et al. Assessing viral shedding and infectivity of tears in coronavirus disease 2019 (COVID-19) patients. *Ophthalmology*. 2020;127(7):977-979. doi:10.1016/j.ophtha.2020.03.026
13. Hanege FM, Kalcioglu MT, Sargin F, Cetinkaya Z, Tekin M, Vahaboglu H. Does cerumen have a risk for transmission of HIV? *Eur J Clin Microbiol Infect Dis*. 2015;34(4):789-793. doi:10.1007/s10096-014-2292-7
14. Bayindir Y, Kalcioglu MT, Durmaz R, Ozturan O. Detection of HCV-RNA in cerumen of chronically HCV-infected patients. *Laryngoscope*. 2005;115(3):508-511. doi:10.1097/01.mlg.0000157828.00509.a0
15. Goh EK, Son BH, Kong SK, Chon KM, Cho KS. Analysis of hepatitis B virus in the cerumen and otorrhea of chronic HBV-infected patients: is there a hepatitis B virus infectivity? *Otol Neurotol*. 2008;29(7):929-932. doi:10.1097/MAO.0b013e31817fdcf3
16. Zhao H, Lu X, Deng Y, Tang Y, Lu J. COVID-19: asymptomatic carrier transmission is an underestimated problem. *Epidemiol Infect*. 2020;148:e116. doi:10.1017/S0950268820001235