



Impact of COVID-19 on Obstructive Sleep Apnea

Jae-Seon Park, Kyung Chul Lee, and Seok Jin Hong

Department of Otorhinolaryngology-Head and Neck Surgery, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, Korea

The coronavirus disease 2019 (COVID-19) pandemic has caused major psychological distress, mental health problems, sleep disturbances, anxiety, and depression. Among them, obstructive sleep apnea (OSA) is known as a comorbidity of diabetes, cardiovascular disease, asthma, obesity, high blood pressure, and chronic obstructive pulmonary disease, and these are poor prognostic factors for COVID-19 morbidity. Therefore, it is important to properly diagnose and treat sleep apnea during the COVID-19 pandemic. Due to the pandemic of COVID-19, in-lab sleep studies such as polysomnography (PSG) tend to slightly decrease, and alternative methods such as home sleep apnea tests (HSAT) and telemedicine tend to emerge relatively. In the post-COVID-19 era, HSAT with a technically adequate device and telemedicine may become an important modality for the diagnosis and treatment of OSA. In addition, the protection of PSG technicians and the disinfection of equipment and the environment of in-lab sleep studies are emphasized. If COVID-19 is ruled out, the use of positive airway pressure devices for therapeutic purposes is not restricted, but efforts should be made to minimize the risk of aerosol generation. Infection and quality control in PSG are important and inevitable issues, and regulation within each institution will be required during and after the COVID-19 pandemic.

Keywords: Obstructive sleep apnea; COVID-19; Polysomnography; Telemedicine; Continuous positive airway pressure

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Corresponding author: Seok Jin Hong, MD, PhD, Department of Otorhinolaryngology-Head and Neck Surgery, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, 29 Saemunan-ro, Jongno-gu, Seoul 03181, Korea.

Tel: 82-2-2001-2264, E-mail: enthsj@hanmail.net

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INTRODUCTION

The coronavirus disease 2019 (COVID)-19 pandemic has affected healthcare systems globally. The COVID-19 pandemic has caused major psychological distress, mental health problems, sleep disturbances, anxiety, and depression [1]. Most people are adapting to the changes caused by COVID-19; however, as social distancing continues, the amount of physical activity and social interaction decreases, resulting in a lowered quality of life. A recent study reported that when adults are under a lot of stress, their sleep deteriorates [2]. In a meta-analysis, the prevalence of sleep problems among the general population was 32.3%, and patients with COVID-19 appeared to be the most affected group, with a pooled rate of 74.8% [1]. A study on mental health effects because of COVID-19 in Korea reported that approximately 30.6% of the people suffered from sleep disorders; in one survey, approximately 61% of Koreans were stressed owing to COVID-19, and this stress interfered with sleep [3].

Although obstructive sleep apnea (OSA) syndrome is not con-

sidered a risk factor for COVID-19, studies have observed that these two conditions have comorbidities in common such as diabetes, cardiovascular diseases, asthma, obesity, hypertension, and chronic obstructive pulmonary disease [4,5].

In patients with cardiopulmonary disease, diabetes, high blood pressure, kidney disease, liver disease, obesity, age 65 years or older, and immunocompromised patients, infection with COVID-19 has fatal consequences. Risk factors for a fatal course of COVID-19 are consistent with the comorbidities of OSA [5]. Therefore, appropriate sleep apnea treatment is important in COVID-19 patients with sleep apnea.

This review aimed to examine the effects of the COVID-19 pandemic on the diagnosis and treatment of this condition.

EFFECT OF COVID-19 ON OSA DIAGNOSIS

Table 1 summarizes the impact of the COVID-19 outbreak on the diagnosis and treatment of OSA. COVID-19 has affected sleep

diagnostics worldwide. Regarding the diagnosis of OSA, in-lab polysomnography (PSG) was reported to be significantly decreased from 92.5% (before COVID-19 pandemic) to 20% (during the pandemic) [6]. This study also proposed telemedicine as a method of patient follow-up [6].

In high epidemic areas in China, sleep study was suspended except in cases of emergency [7] (Table 2).

On April 2020, the American Academy of Sleep Medicine (AASM) revised the recommendations for PSG and laboratory positive airway pressure (PAP) titration [8] (Table 2).

Table 1. Effect of COVID-19 pandemic on diagnosis and treatment of OSA

Summary of effect	
Diagnosis	<ul style="list-style-type: none"> • Consultation with patients has been replaced by phone calls or telemedicine [6,7,17,18]. • Most laboratory sleep studies, including polysomnography, have been avoided or postponed during COVID-19 pandemic [6,7,17,18]. • In low-epidemic areas, laboratory sleep studies were performed after excluding COVID-19, or portable home sleep study devices were used [7]. • It is recommended that sleep technicians wear PPE, equipment is adequately sterilized, and disposable parts are used [7,18].
Treatment	<ul style="list-style-type: none"> • Adherence to PAP increased and the proportion of very low adherers decreased in European studies [13,19]; however, in some studies, there were no significant difference in hours of PAP usage per day and in PAP adherence [14,15]. • It is not recommended to stop PAP for the entire epidemic duration, but it is recommended to temporarily discontinue it during a COVID-19 [17,20]. • If a patient with severe OSA is diagnosed with COVID-19, treatment at a healthcare facility is recommended [21]. • Isolating PAP users from other family members is always controversial; however, it is recommended to use PAP in an independent space away from family as much as possible [8,17,22]. • A PAP circuit component has been developed that allows exhaled air to pass through a filter [21].

COVID-19, coronavirus disease 2019; OSA, obstructive sleep apnea; PPE, personal protection equipment; PAP, positive airway pressure

Table 2. Recommendations from sleep societies in each country on sleep testing after the COVID-19 pandemic

Sleep society	PSG or in-lab study	HSAT	PAP study
AASM [8,23]	AASM has provided recommendations according to the local transmission of SARS-CoV-2 1. In case of none to minimal community transmission resume in lab studies 2. In any other case as of: a) substantial local transmission: consider postpone or resume only for emergencies and after screening for symptoms and testing for COVID-19, and b) minimal to moderate local transmission: resume only in those who are not at higher risk for severe illness according to CDC	Restrict services	1. Continue in lab PAP studies for cases of no or minimal community transmission 2. Postpone in lab PAP studies in any other case, or as an exception, administration of PAP can be offered to isolation room and not in the ward.
Australasian Sleep Society [24]	Recommend in-lab sleep study	Continue to use if possible	May Recommend according to patient compliance and government guidelines; Vented mask is recommended for home use
British Sleep Society [25]	Performed with patient assessment, technician protection, and environmental and equipment disinfection	Limited studies are ongoing for the diagnosis of SBD	Performed with PPE wear, environmental disinfection and air exchange due to the risk of aerosol formation; PAP testing at home, wearing an appropriate mask, and use of a non-vented mask with filter are recommended
Canadian Thoracic Society [26]	Limited practice in clinical emergencies	Not recommended as a substitute for PSG, but preferred when rapid study is required	Recommended to postpone the PAP test as much as possible; Use a new product rather than a rental device if urgently needed
Chinese Thoracic Society [7]	Limited practice in patients with severe cardiopulmonary disease and hypoventilation syndrome excluded from COVID-19	More recommended than in-lab studies for diagnosing OSA	Automated PAP studies at home is recommended, but in-lab testing is required for patients with comorbidities

AASM, American Academy of Sleep Medicine; CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus disease 2019; HSAT, home sleep apnea test; Lab, laboratory; OSA, obstructive sleep apnea; PAP, positive airway pressure; PPE, personal protective equipment; PSG, polysomnography; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; SBD, sleep-disordered breathing

Diagnostic tools with robust decontamination procedures for reusable equipment will need to be developed for patients with OSA.

Traditionally, laboratory PSG has been the gold standard diagnostic procedure in sleep medicine; however, clinical studies indicate that the home sleep apnea test (HSAT), when used in uncomplicated patients with a high probability of moderate-to-severe OSA, may provide diagnostic accuracy similar to that of PSG for moderate and severe OSA [9]. For the first time, the clinical practice guidelines for diagnostic testing of adult sleep apnea by the AASM formulated a strong recommendation that both PSG and HSAT are appropriate diagnostic testing options for uncomplicated adult patients who are at an increased risk of moderate to severe sleep apnea [10]. Some European panel discussions have suggested that during the coronavirus pandemic, the HSAT is preferred over in-laboratory testing based on COVID-19 epidemiological status and test availability [11]. The development of non-contact, disposable sleep tests or sleep diagnosis using telemedicine is in progress, and these diagnostic modalities are expected to be put into practical use in the future.

EFFECT OF THE COVID-19 PANDEMIC ON TREATMENT AND MANAGEMENT OF OSA

In the UK, the British Sleep Society with the OSA Alliance (incorporating the British Thoracic Society, British Sleep Society, Association for Respiratory Technology and Physiology, and Sleep Apnea Trust Association) has released guidelines regarding the use of continuous PAP during the pandemic [12]. Although little scientific evidence is available on the risk of infection from PAP use in a pandemic situation, it has the potential to transmit infection to nearby people owing to aerosol generation because of air leak and high positive air flow. Therefore, it is recommended to use PAP in an independent space away from the family as much as possible, and methods to reduce close contact for the initial setting and management are recommended [8]. Regarding PAP treatment during the COVID-19 pandemic, PAP adherence increased in European studies [13]; however, in some studies, there were no significant differences in the hours of PAP usage per day and PAP adherence [14,15] (Table 1).

Non-surgical treatments, such as weight control, positional therapy, abstinence from alcohol, and medication for nasal congestion, are recommended [8,16].

CONCLUSIONS

COVID-19 has had a significant impact on the diagnosis and treatment of OSA. Infection and quality control in PSG are important and inevitable issues, and regulation within each institution is necessary during and after the COVID-19 pandemic. In the post-COVID-19 era, HSAT with a technically adequate device and telemedicine may become an important modality for the di-

agnosis and treatment of OSA in uncomplicated and select adult patients, and further studies are needed to confirm their use.

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None

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Availability of Data and Material

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Author Contributions

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ORCID iDs

Jae-Seon Park 
<https://orcid.org/0000-0001-8622-255X>

Kyung Chul Lee 
<https://orcid.org/0000-0003-4014-2161>

Seok Jin Hong 
<https://orcid.org/0000-0002-9061-0552>

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