Prolonged Dysphagia After a COVID-19 Infection in a Patient With Parkinson Disease

Min-Yong Lee, MD, Byung-Mo Oh, MD, PhD, and Han Gil Seo, MD, PhD

Abstract: Coronavirus disease 2019 might have an impact on patients with Parkinson disease because of the neuroinvasive potential. Herein, we report the case of a patient with Parkinson disease who developed severe and prolonged oropharyngeal dysphagia after a coronavirus disease 2019 infection. A 73-yr-old male patient with Parkinson disease was diagnosed with coronavirus disease 2019 and admitted to a tertiary care hospital. Before hospitalization, he was assessed at Hoehn and Yahr stage 4 and showed no symptoms of dysphagia. After admission, the patient gradually recovered; however, he was fed through a nasogastric tube. A videofluoroscopic swallowing study revealed a severe oropharyngeal dysphagia with a severely delayed oral phase. Therefore, he underwent percutaneous gastrostomy tube insertion. After discharge, although he received swallowing therapy for 4 mos, he still had severe dysphagia, which made him dependent on enteral feeding. We speculate that the impact of coronavirus disease 2019 on dopaminergic and nondopaminergic mechanisms could lead to the development of dysphagia in this patient. The present case suggests that clinicians must have a high index of suspicion without dismissing the possibility of dysphagia and subsequent aspiration pneumonia in coronavirus disease 2019 patients with Parkinson disease.

Key Words: Parkinson Disease, COVID-19, Dysphagia

(*Am J Phys Med Rehabil* 2021;100:837–839)

Coronavirus disease 2019 (COVID-19) might have an impact on patients with neurodegenerative conditions because of the neuroinvasive potential of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1–3] Severe acute respiratory syndrome coronavirus 2 is known to have a high probability of penetrating the cortex and substantia nigra, highly associated with neurodegenerative diseases.[4] Although further research is still needed, there have been several observations of the link between COVID-19 and Parkinson disease (PD). Severe acute respiratory syndrome coronavirus 2 penetrates the brain via angiotensin-converting enzyme 2 receptors, highly expressed in dopaminergic neurons.[5] In addition, SARS-CoV-2 enters the brain through the nasal cavity, causing anosmia, a common premotor feature of PD.[4] Recent studies have reported that PD patients with COVID-19 experienced significant worsening of both the motor and nonmotor symptoms.[4] Antonini et al.[6] reported that older patients with advanced PD were particularly susceptible to COVID-19 and had a high mortality rate.

Oropharyngeal dysphagia is a common feature of PD with a complex pathophysiology involving both the dopaminergic and nondopaminergic mechanisms.[7] Herein, we report the case of a patient with PD who developed severe and prolonged oropharyngeal dysphagia after a COVID-19 infection. The present case was approved by the Seoul National University Hospital Institutional Review Board (H-2012-137-1183), and the written informed consent was obtained from the legally authorized representative of the patient.

CASE PRESENTATION

This study conforms to the consensus-based clinical case reporting guideline and reports the required information accordingly (see Supplemental Checklist, Supplemental Digital Content 1, http://links.lww.com/PHM/B334). A 73-yr-old male patient with PD was transferred from an acute care hospital to a tertiary care hospital for COVID-19 deterioration, which was diagnosed 10 days prior by polymerase chain reaction test for SARS-CoV-2. Before hospitalization, he was able to walk around his house (Hoehn and Yahr stage 4) and showed no symptoms of dysphagia, although he was on antiparkinsonian medications (levodopa/carbidopa/entacapone [375/93.75/600 mg daily], carbidopa/levodopa [62.5/250 mg daily], and ropinirole [3 mg daily]). Besides the diagnosis of PD, he had an unremarkable medical history.

Upon admission, he required oxygen therapy via a high-flow nasal cannula. Chest computed tomography (CT) revealed multiple ground-glass opacities throughout his lungs. Remdesivir and antibiotics were prescribed against viral and possible superimposed bacterial pneumonia. Antiparkinsonian medications were administered similarly to the previous prescription (carbidopa/levodopa [175/700 mg daily], entacapone [600 mg daily], and ropinirole [3 mg daily]), and other drugs that might affect PD were not administered during the hospitalization.

After admission, the patient gradually recovered. On hospital days (HD) 4 and 5, polymerase chain reaction tests for SARS-CoV-2 were negative, and oxygen supplementation was tapered off on HD 6. Remdesivir administration was terminated on HD 10 and antibiotics on HD 14. However, antibiotics were readministered 2 days later for 14 days because of suspicion of aspiration pneumonia.

From the Department of Rehabilitation Medicine, Seoul National University Hospital, Seoul, South Korea (M-YL, B-MO, HGS); Department of Rehabilitation Medicine, Seoul National University College of Medicine, Seoul, South Korea (B-MO); and National Traffic Injury Rehabilitation Hospital, Yangpyeong, South Korea (B-MO).

All correspondence should be addressed to: Han Gil Seo, MD, PhD, Department of Rehabilitation Medicine, Seoul National University Hospital, 101 Daehak-Ro, Jongno-Gu, Seoul 03080, South Korea.

M-YL participated in obtaining the informed consent and drafting the manuscript. B-MO critically reviewed the manuscript. HGS developed the original idea, obtained the informed consent, and supervised the entire process. All authors participated in the editing of the manuscript. All authors read and approved the final manuscript.

Financial disclosure statements have been obtained, and no conflicts of interest have been reported by the authors or by any individuals in control of the content of this article.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.ajpmr.com).

ISSN: 0894-9115
DOI: 10.1097/PHM.0000000000001825

On admission, he was drowsy and bedridden. On HD 5, he was able to roll onto both sides but had difficulties maintaining an unsupported sitting position. On HD 9, he became alert and was able to communicate simply. He was able to respond to the person and place. Brain contrast CT on HD 12 showed no remarkable findings, except for mild brain atrophy. Shortly before discharge, he still had difficulty in maintaining a sitting position.

After admission, the patient was fed through a nasogastric tube because of the risk of aspiration. It was challenging to determine when dysphagia symptom first occurred as the patient did not consume an oral diet. He had no hoarseness, and his palatine arch elevation and gag reflex were normal. A videofluoroscopic swallowing study (VFSS) was conducted on HD 25, and it revealed a severe oropharyngeal dysphagia with a severely delayed oral phase. He aspirated 2 ml of thin liquid without coughing because of premature leakage and was unable to transfer food from the oral cavity to the pharynx. Incomplete pharyngeal constriction and a delayed swallowing reflex were also observed (see Supplemental Video, Supplemental Digital Content 2, http://links.lww.com/PHM/B347). Therefore, the maintenance of the nasogastric tube feeding was recommended. After that, he was discharged on HD 29.

Two weeks later, he removed the nasogastric tube and attempted an oral diet on his own. However, he aspirated several times and was subsequently presented to the emergency department with respiratory failure. He was intubated and treated with a mechanical ventilator for 3 days in the intensive care unit. After 14 days of antibiotic treatment, he improved and was discharged. He underwent percutaneous gastrostomy tube insertion before discharge.

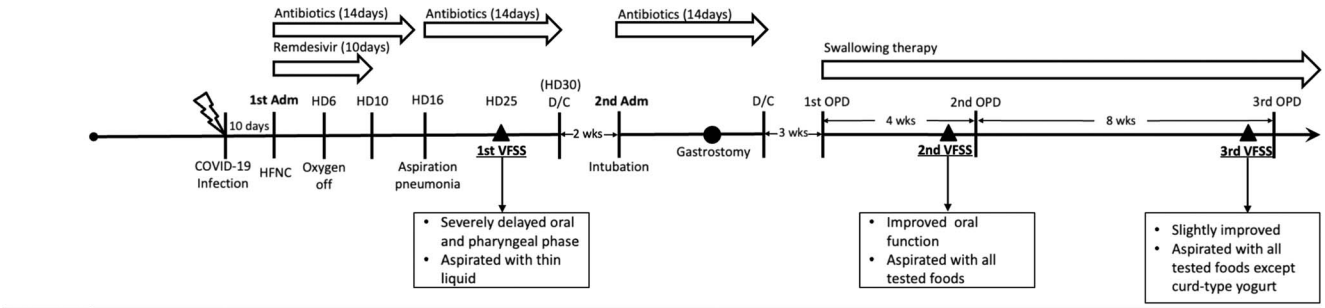
Three weeks later, he began swallowing therapy at the outpatient department of the rehabilitation center. Swallowing therapy included neck and facial muscle stretching, sensory stimulation (thermal-tactile stimulation and vibration), tongue and jaw range of motion exercises, oral motor strengthening, training for loud voice, vocal cord adduction exercise, training of dry swallow with chin-tuck maneuver, and training to trigger the swallowing reflex. Around this time, he was able to stand with support and maintained the gastrostomy tube feeding. His antiparkinsonian medications were changed to levodopa/carbidopa/entacapone (375/93.75/600 mg daily), carbidopa/levodopa (62.5/250 mg daily), levodopa/benserazide (100/25 mg daily), and ropinirole (3 mg daily).

One month later, a second VFSS showed that his oromotor function had improved, allowing the transfer of the food bolus from the oral cavity to the pharynx. However, postswallow aspirations without coughing were observed for all the tested foods including thin liquid, nectar-like thickened liquid, curd-type yogurt, and soft rice due to the overflow of the pyriform sinus residue. The patient attempted to swallow multiple times to reduce the residue, but it was ineffective. Incomplete pharyngeal constriction and a delayed swallowing reflex persisted (see Supplemental Video, Supplemental Digital Content 2, http://links.lww.com/PHM/B347). Therefore, maintaining the gastrostomy tube feeding was recommended. At that time, he was able to walk with the help of a walker at home. A third VFSS after 2 mos showed that his swallowing function was slightly improved (see Supplemental Video, Supplemental Digital Content 2, http://links.lww.com/PHM/B347), allowing him to swallow a small amount of curd-type yogurt. However, he still had severe dysphagia, which made him dependent on enteral feeding. Figure 1 summarizes the timeline.

DISCUSSION

In this case, the patient with PD developed severe oropharyngeal dysphagia after COVID-19, which resulted in aspiration pneumonia. Although he neither underwent intubation nor received intensive care unit care during the first admission for COVID-19, severe oropharyngeal dysphagia occurred, which had not fully recovered after 5 mos.

Despite the COVID-19 infection, the respiratory distress could not explain the extent of his dysphagia because his respiratory symptoms were not severe on the first admission. He had no focal neurological deficit, and brain contrast CT showed unremarkable findings. There was a possibility of cranial neuropathies or myositis, as reported in previous COVID-19 patients.[8,9] However, there were no symptoms or signs in this patient to suspect a glossopharyngeal or vagal



Diet	Regular diet	Nasogastric tube feeding	Gastrostomy tube feeding
Physical function	Walk around home	Bed-ridden	Stand with support / Walker gait
Medication	levodopa/carbidopa/entacapone (375/93.75/600 mg daily) carbidopa/levodopa (62.5/250 mg daily) ropinirole (3 mg daily)	carbidopa/levodopa (175/700 mg daily) entacapone (600 mg daily) ropinirole (3 mg daily)	levodopa/carbidopa/entecapone (375/93.75/600 mg daily) carbidopa/levodopa (62.5/250 mg daily) levodopa/benserazide (100/25 mg daily) ropinirole (3 mg daily)

Adm; Admission, HD; Hospital day, OPD; outpatient department, HFNC; high flow nacal cannula, VFSS; videofluoroscopic swallowing study

FIGURE 1. Timeline of the present case.

neuropathy. Myositis was also unlikely in this case because he did not have muscle pain or elevated serum creatine kinase levels.

Disuse is one of the causes of the patient's dysphagia; however, it is unlikely in this case because dysphagia persisted while the physical function gradually improved. We speculate that the impact of COVID-19 on PD could lead to the development of dysphagia. Although the pathophysiology of dysphagia in PD is poorly understood, dopaminergic and nondopaminergic mechanisms may be involved in the development of dysphagia in PD.[7] The dopaminergic system plays a significant role in the supramedullary swallowing system and is closely associated with volitional swallow.[10] In the current case, COVID-19 might have affected dopaminergic neurons, resulting in severe oromotor dysfunction and impaired voluntary swallowing. Pavel et al.[11] hypothesized that SARS-CoV-2 infection might selectively precipitate the degeneration of dopaminergic neurons, and Antonini et al.[6] suggested that SARS-CoV-2 may bind angiotensin-converting enzyme 2 receptors, which are highly expressed in dopaminergic neurons in the brain and increase the requirement of dopaminergic medication. However, the dopaminergic mechanism alone is insufficient to explain the pharyngeal phase dysfunction. Adaptive cortical changes in the swallowing function in PD as suggested by Suntrup et al.[12] may explain the pharyngeal dysphagia seen in this patient. He was in the Hoehn and Yahr stage 4 before infection, and degeneration of the brainstem nuclei may have progressed. Nevertheless, adaptive cortical changes would have maintained the swallowing function. After the COVID-19 infection, cortical adaptation may have been damaged by the SARS-CoV-2 invasion of the central nervous system, deteriorating the pharyngeal swallowing function.

This report presents a case of severe and prolonged oropharyngeal dysphagia that developed after COVID-19 infection in a PD patient without swallowing difficulties. To the best of our knowledge, this is the first reported case in which dysphagia persisted despite the recovery from COVID-19 in patients with PD. Although the underlying mechanism remains unclear, the present case suggests that clinicians must have a high index of suspicion without dismissing the possibility of dysphagia and subsequent aspiration pneumonia in COVID-19 patients with PD.

REFERENCES

1. Helms J, Kremer S, Merdji H, et al: Neurologic features in severe SARS-CoV-2 infection. *N Engl J Med* 2020;382:2268–70
2. Achar A, Ghosh C: COVID-19-associated neurological disorders: the potential route of CNS invasion and blood-brain relevance. *Cell* 2020;9:2360
3. Iadecola C, Anrather J, Kamel H: Effects of COVID-19 on the nervous system. *Cell* 2020;183:16–27.e1
4. Ferini-Strambi L, Salsone M: COVID-19 and neurological disorders: are neurodegenerative or neuroimmunological diseases more vulnerable? *J Neurol* 2021;268:409–19
5. Nataf S: An alteration of the dopamine synthetic pathway is possibly involved in the pathophysiology of COVID-19. *J Med Virol* 2020;92:1743–4
6. Antonini A, Leta V, Teo J, et al: Outcome of Parkinson's disease patients affected by COVID-19. *Mov Disord* 2020;35:905–8
7. Suttrup I, Warnecke T: Dysphagia in Parkinson's disease. *Dysphagia* 2016;31:24–32
8. Ishkanian A, Mehl A: Clinical conundrum: dysphagia in a patient with COVID-19 and progressive muscle weakness. *Dysphagia* 2020:1–2. doi: 10.1007/s00455-020-10205-z
9. Aoyagi Y, Ohashi M, Funahashi R, et al: Oropharyngeal dysphagia and aspiration pneumonia following coronavirus disease 2019: a case report. *Dysphagia* 2020;35:545–8
10. Leopold NA, Daniels SK: Supranuclear control of swallowing. *Dysphagia* 2010;25:250–7
11. Pavel A, Murray DK, Stoessl AJ: COVID-19 and selective vulnerability to Parkinson's disease. *Lancet Neurol* 2020;19:719
12. Suntrup S, Teismann I, Bejer J, et al: Evidence for adaptive cortical changes in swallowing in Parkinson's disease. *Brain* 2013;136:726–38