




# Neurologic Presentations of COVID-19: A Case Series

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## Abstract

**Introduction:** The new pandemic of coronavirus disease 2019 (COVID-19) has evolved certain neurologic syndromes as a presentation of this disease that should be integrated into the whole disease process.

**Case Presentations:** We present cases of neurologic involvement in adult patients with documented bronchopulmonary COVID-19. Certain signs and symptoms are introduced, including new onset seizures, ischemic stroke, and altered mental status in otherwise minimal clinical signs and symptoms of COVID-19.

**Conclusions:** Many neurologic presentations are diagnosed in resolving COVID respiratory infections or in an otherwise asymptomatic individual.

**Keywords:** Altered Level of Consciousness, Headache, SARS Coronavirus, Seizure

## 1. Introduction

Coronavirus disease 2019 (COVID-19) can present with various respiratory, gastrointestinal, and cardiac symptoms. Neurological symptoms can be the first symptoms in patients with COVID-19. It is important to note that many of these patients might have had brief symptoms of this infectious disease in recent weeks or days that the patient may have forgotten (1).

In general, it is not evident whether these patients are more likely to develop persistent neurological symptoms over time; hence, further studies are needed. A few of these neurologic presentations were proven to be COVID-19 by polymerase chain reaction (PCR) test of cerebrospinal fluid (CSF) or neuronal tissues.

In this case series of COVID-19 patients, we present typical cases of neurologic involvement as characteristic findings of COVID-19, mainly without other disease-related symptoms in adult patients with documented bronchopulmonary SARS-CoV2 infection to globally unify signs and symptoms as a multisystem disease.

The University of Medical Sciences Institutional Review Board approved this study. Informed written consent was obtained from the patients or their relatives.

## 2. Case Presentation

### 2.1. Case 1

An 85-year-old man presented to the emergency department complaining of a seizure occurring three times

in the past week, the latter manifested last night. The seizure episodes were in the form of typical generalized tonic clonic seizures. He had no history of seizures in the past, and the patient's neurological examination was otherwise unremarkable. He did not complain of any respiratory or gastrointestinal symptoms. Vital signs were normal. Past medical history was negative. The bedside glucometer and the electrocardiogram (ECG) taken from the patient at the emergency room were normal. The patient underwent a brain computed tomography (CT) scan, which was unremarkable. The metabolic causes of seizure were obviated, including normal blood sugar, electrolytes, and renal function tests. He delivered an intravenous phenytoin infusion of 20 mg/kg in the emergency department. Cerebrospinal fluid (CSF) analysis and PCR were negative for conventional bacterial, coronavirus, and herpes simplex virus (HSV), respectively. Brain magnetic resonance imaging (MRI) was reported to be normal, lung CT scan incidentally showed ground glass opacities, and the patient was isolated due to suspicion of COVID-19, and SARS-CoV2 PCR of the nasopharynx specimen was positive. Finally, the patient was transferred to the COVID-19 ward for three days, after which he was discharged due to the appropriate general condition and non-recurrence of seizures.

### 2.2. Case 2

A 65-year-old woman complained of numbness in the right side of her body. The right-side paresthesia started 6 hours before entering the emergency room, and gradual

right hemiplegia developed. The patient had no history of neurological or any other disease. The bedside glucometer and ECG were normal. A brain CT scan was requested, which showed hypodensity in the territory of the left middle cerebral artery in favor of an ischemic stroke. The patient also complained of generalized body pain within the last months with no respiratory complaints. The patient was referred late to deliver thrombolysis. On chest CT scan, peripheral ground glass opacities were seen. The COVID-19 nasopharynx PCR test was positive. Echocardiography and color Doppler ultrasonography of cervical arteries were reported normal, looking for etiology of acute ischemic stroke. Finally, the patient was admitted and isolated in the COVID-19 ward.

### 2.3. Case 3

A 60-year-old woman was found unconscious in her room and transferred by EMS to the emergency department with a decreased level of consciousness to the extent that she did not respond to verbal or painful stimuli. She had no fever and no signs of trauma or meningismus. Pupils were slightly miotic with sluggish reactions to light. Thus, she was intubated and mechanically ventilated. The blood glucose level was high, and ECG was unremarkable. She was initially resuscitated in the emergency room. A brain CT scan showed evidence of ischemic stroke in the pons. She did not receive thrombolytic therapy as the stroke onset was not evident. A pulmonary CT scan exhibited ground glass consolidations in favor of COVID-19 disease. The COVID-19 PCR test of the patient was positive though she had not expressed any respiratory complaints and had no history of respiratory problems in the last few days, according to her relatives. Hyperglycemia was controlled, and she did not have a remarkable acid-base abnormality. Due to respiratory compromise, the patient was transferred to the intensive care unit and, unfortunately, deceased after two days.

### 2.4. Case 4

A 64-year-old woman was brought to the emergency room with altered mental status. She exhibited headaches followed by unexplained agitation lasting for several hours, after which two episodes of generalized tonic clonic seizures occurred. The patient seemed to be in the post-ictal period, becoming more agitated and fearful of their surroundings in the emergency room. Past medical history was unremarkable except for hypertension, for which losartan potassium was consumed. The bedside glucometer and brain CT scan were normal. Serum electrolyte levels were within normal limits. She underwent a lumbar puncture which revealed normal cerebrospinal fluid analysis, and PCR was negative for Coronavirus and HSV. In the

pulmonary CT scan, evidence of several ground glass consolidations was seen, which raised suspicion of COVID-19 disease, although the patient had not expressed any respiratory complaints in the last few days. The nasopharyngeal PCR test was positive for COVID-19. Brain MRI did not show pathologic findings. After several hours of observation, she was alert and oriented and in the baseline mental status and referred to a neurologist for further outpatient assessment.

Table 1 expresses the detailed clinical findings and laboratory and imaging investigations performed on these patients. All the patients belonged to the same ethnicity.

## 3. Discussion

In this study, various neurologic presentations of COVID-19 are presented. Although similar to other studies, sufficient data for histopathology involvement is lacking (1, 2).

Recently, seizures, demyelinating disease, encephalopathy, polyneuropathy, CNS vasculitis, encephalitis, ischemic or hemorrhagic stroke, and Guillain-Barre disease have been reported to be presented in COVID-19 patients along with pulmonary involvement or diagnosed by positive PCR without any other respiratory complaints (1, 3-5). Some neuropsychiatric disorders were reported, including psychosis, neurocognitive (dementia-like) syndrome, and affective disorders (6). Many patients with neurologic involvement did not acquire worse prognostic factors (7).

It is prudent to screen patients for COVID-19 presenting with new neurological symptoms who have no previous history of these attacks during the pandemic. Reports of generalized seizures, despite normal MRI, may raise probable idiopathic generalized epilepsy without structural or metabolic etiology, although an acute symptomatic seizure due to SARS-CoV-2-associated encephalitis should be excluded, as observed in cases 1 and 4.

### 3.1. Conclusions

It is necessary to consider various presentations by taking a suggestive medical history and clinical suspicion of COVID-19 to make a proper diagnosis. Addressing the neurologic presentations is also helpful to timely isolate involved patients in order to prevent the disease from spreading in hospital wards.

### 3.2. Limitations

As several presentations are emerging, there are still new horizons for the management of neurologic involvement in these patients, and these can be further assessed.

**Table 1.** Detailed Clinical Findings and Laboratory and Imaging Investigations

Patient Investigations	Patient 1	Patient 2	Patient 3	Patient 4
Age, y/ gender	85/M	65/F	60/F	64/F
Onset	Acute on chronic	Acute	Acute	Acute
Main clinical presentation	Seizures 3 times in one month ago	Hemiparesis	Loss of consciousness	Headache, two seizures within an hour, agitation
Additional clinical features	-	Fatigue	Hyperglycemia	Agitation
Brain CT scan	Normal	No obvious finding	Pons hypodensity	Normal
Brain MRI	Normal	Hypersignal in DWI	-	Normal
Chest CT scan	Moderate to severe peripheral GGO	Moderate peripheral GGO	Severe peripheral GGO	Moderate peripheral GGO
WBC (4000 - 1000)	8400	9800	7700	10100
Lymph	310	890	600	1000
LDH (140 - 280 U/L)	355	211	254	278
CPK (40 - 300 U/L)	251	335	300	326
Blood sugar (70 - 140 mg/dL)	158	149	480	158
Urea (7 - 20 mg/dL)	33	38	32	29
Creatinine (0.84 - 1.21 mg/dL)	1.2	1	1	1.5
D-Dimer (< 250 ng/mL)	85	65	100	456
Troponin (< 13 ng/mL)	0.1	0.2	0.3	0.2
CSF	Normal	-	-	Normal
Outcome	Fair	Fair	Deceased	Fair

## Footnotes

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## References

- Montalvan V, Lee J, Bueso T, De Toledo J, Rivas K. Neurological manifestations of COVID-19 and other coronavirus infections: A systematic review. *Clin Neurol Neurosurg.* 2020;**194**:105921. [PubMed ID: 32422545]. [PubMed Central ID: PMC7227498]. <https://doi.org/10.1016/j.clineuro.2020.105921>.
- Ng Kee Kwong KC, Mehta PR, Shukla G, Mehta AR. COVID-19, SARS and MERS: A neurological perspective. *J Clin Neurosci.* 2020;**77**:13-6. [PubMed ID: 32417124]. [PubMed Central ID: PMC7198407]. <https://doi.org/10.1016/j.jocn.2020.04.124>.
- Lahiri D, Ardila A. COVID-19 Pandemic: A Neurological Perspective. *Cureus.* 2020;**12**(4). e7889. [PubMed ID: 32489743]. [PubMed Central ID: PMC7255551]. <https://doi.org/10.7759/cureus.7889>.
- Baig AM. Neurological manifestations in COVID-19 caused by SARS-CoV-2. *CNS Neurosci Ther.* 2020;**26**(5):499-501. [PubMed ID: 32266761]. [PubMed Central ID: PMC7163592]. <https://doi.org/10.1111/cns.13372>.
- Abdi S, Ghorbani A, Fatehi F. The association of SARS-CoV-2 infection and acute disseminated encephalomyelitis without prominent clinical pulmonary symptoms. *J Neurol Sci.* 2020;**416**:117001. [PubMed ID: 32590204]. [PubMed Central ID: PMC7301801]. <https://doi.org/10.1016/j.jns.2020.117001>.
- Varatharaj A, Thomas N, Ellul MA, Davies NWS, Pollak TA, Tenorio EL, et al. Neurological and neuropsychiatric complications of COVID-19 in 153 patients: a UK-wide surveillance study. *Lancet Psychiatry.* 2020;**7**(10):875-82. [PubMed ID: 32593341]. [PubMed Central ID: PMC7316461]. [https://doi.org/10.1016/S2215-0366\(20\)30287-X](https://doi.org/10.1016/S2215-0366(20)30287-X).
- Gupta S, Hayek SS, Wang W, Chan L, Mathews KS, Melamed ML, et al. Factors Associated With Death in Critically Ill Patients With Coronavirus Disease 2019 in the US. *JAMA Intern Med.* 2020;**180**(11):1436-47. [PubMed ID: 32667668]. [PubMed Central ID: PMC7364338]. <https://doi.org/10.1001/jamainternmed.2020.3596>.