

Status epilepticus and the presence of SARS-COV-2 in the cerebrospinal fluid: a case report

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Abstract

A growing number of studies indicate a broad range of neurological manifestations, including seizures, occur in patients with COVID-19 infection. We report a 29-yers old female with status epilepticus and positive SARS-CoV-2 in the cerebrospinal fluid. Our findings support previous reports suggesting seizure as a possible symptom of COVID-19 infection.

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Abstract

A growing number of studies indicate a broad range of neurological manifestations, including seizures, occur in patients with COVID-19 infection. We report a 29-yers old female with status epilepticus and positive SARS-CoV-2 in the cerebrospinal fluid. Our findings support previous reports suggesting seizure as a possible symptom of COVID-19 infection.

Keywords: Seizure, Neuroinvasive, COVID-19 infection

Introduction

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) could infect various organs by different mechanisms (1). This includes the central nervous system (CNS) and peripheral nervous system (2). Examination of autopsy tissue from the patients with SARS-CoV-2 infection demonstrated that this virus has the potential to enter the CNS via attacking the vascular system and damaging the blood-brain barrier (3). Furthermore, post-mortem examination of patients infected with COVID-19 has revealed that SARS-CoV-2 could directly target cortical neurons, which may be associated with immune cell infiltration in the brain (4-5). Among various neurological manifestations, the occurrence of seizures during the acute phase of SARS-CoV-2 infection has been reported (5-6). Here, we report a patient with status epilepticus and a positive SARS-CoV-2 ribonucleic acid test of the cerebrospinal fluid (CSF).

Case presentation

A 29-year-old female was brought to the emergency department with frequent episodes of generalized tonic-clonic seizures. There was no history of prior seizure, headache, behavioral change, hemiparesis, and any other neurological symptoms. Likewise, she had no other symptoms regarding involvement of other organs by COVID-19 at the time of admission. The seizures were stopped with a loading dose of levetiracetam (3000 mg per day). Initial brain and chest computed tomography scans as well as brain magnetic resonance imaging with and without contrast did not show any abnormality (Figure 1). Using the real-time polymerase chain reaction (RT-PCR) test, the nasopharyngeal swab sample was positive for SARS-CoV-2. CSF analysis indicated normal opening pressure with normal glucose and protein levels. The CSF culture was negative for different microorganisms. Antibodies responsible for autoimmune encephalitis were also negative. However, the RT-PCR test for SARS-CoV-2 in the CSF was positive. The electroencephalogram revealed epileptiform discharges in bilateral temporal areas (figure 2). The summary of the laboratory data is shown in Table 1.

During hospitalization, the patient received a maintenance dose of levetiracetam (3000 mg/day) and sodium valproate (1600 mg/day). The antiviral treatment was also started with 200 mg remdesivir on day 1, followed by 100 mg daily for 4 days. After one week, the patient was discharged from the hospital with no seizure. The patient remained seizure-free during 2 months' follow-up.

Discussion

Various investigations have reported different neurological disorders attributable to COVID-19, including cerebrovascular accidents, transverse myelitis, Guillain-Barre syndrome, and encephalitis (7-8). As other possible diseases were excluded through suitable clinical and laboratory tests, this report suggests the neuroinvasive potential of SARS-CoV-2.

Increasing evidence suggests that SARS-CoV-2 might have neuro-invading potential, which may cause clinical symptoms and brain damage (9). It has been demonstrated that other coronaviruses may invade the CNS and cause an influx of inflammatory cytokines. Human coronavirus OC43 (HCoV-OC43) is capable of invading neural cells *in vitro* and causing widespread neuronal damage (10). Infection with other coronaviruses, like SARS and the Middle East Respiratory Syndrome viruses, was associated with various neurological manifestations (11). It has been reported that SARS-CoV-1 in mice transgenic for the human angiotensin-converting enzyme-2 (ACE2) receptor can attack the CNS (12). Like SARS-CoV-1, SARS-CoV-2 uses the ACE2 receptor to infect the human cells. Therefore, SARS-CoV-2 may target the CNS through this receptor (13). In summary, this report supports the possibility of seizures in patients with COVID-19 infection in the absence of respiratory symptoms. More investigations are needed to determine the potential mechanisms that lead to seizures following SARS-CoV-2 infection.

Declarations

Ethics approval and consent to participate:

This study was conducted in accordance with the declaration of Helsinki.

Consent for publication:

Written informed consent was obtained from the patient for publication of this Case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Availability of data and materials:

Not applicable.

Competing interests:

The authors declare no conflict of interest.

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Authors' contributions:

All authors have read and approved the manuscript.

SA: Drafted, did background research, reviewed results and revised the manuscript.

RA: Reviewed results and revised the manuscript.

AG: Did background research, reviewed results and revised the manuscript

ZM: Involved in patient management, collected history, did background research, reviewed results and revised the manuscript.

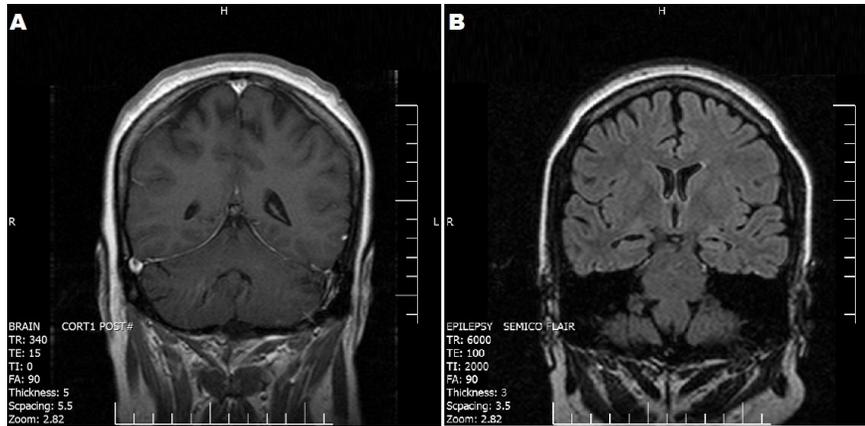


Figure 1 - Brain MRI with (A) and without (B) contrast.



Figure 2- EEG showed bilateral temporal epileptiform discharges.

Table 1- Laboratory data of the patient

Reference value	Results	Variable	Variable
4.0-10	16.9 *1000/mm ³	WBC	Blood test
F:4.2-5.4	5.39 * 10 ⁶ /mm ³	RBC	
F:12-16	9.4 (g/dl)	Hb	
77-97	59.2 fL	MCV	
140-440	419 *10 ³ /mm ³	Plt	
12-150 ng/mL	14.5 ng/mL	Ferritin	
<31	23 U/L	AST	
<31	16 U/L	ALT	
Up to 270	142 IU/L	ALP	
26-140	88 U/L	CPK	
Up to 24	10 U/L	CK-MB	
0-0.6	0.5 µg/ml	D-Dimer	
Female: <20	22 mm/hr	ESR	
Normal: Up to 6	3 mg/L	CRP Quantitative	
8.6-10.3	10 mg/dl	Ca	
Adult: 1.8- 2.6	1.9 mg/dl	Mg	
135-145	140 mmol/L	Na	
3.5-5.5	4 mmol/L	K	
Female: 0.6-1.3	1.1 mg/dl	Creatinine	
225-500	325 U/mL	LDH	
Adult: 6.6- 8.8	7.1 g/dl	Total protein	
100-145	112 mg/dl	Blood Sugar	
0-5	0	WBC	CSF
0-6	10 cell	RBC	
50-80	79 mg/dl	Glucose	
15-45	15 mg/dl	Total Protein	
0-40	34 U/L	LDH	
-	NO growth	CSF culture:	

Reference value	Results	Variable	Variable
Detected: positive	Positive	Nasopharynx for	PCR
Non-detected: negative		COVID-19 PCR:	
Detected: positive	Positive	CSF for COVID-19 PCR:	
Non-detected: negative			

White blood cells (WBCs), Red blood cells (RBCs), Hemoglobin (Hb), Mean corpuscular volume (MCV), Platelet (Plt), Aspartate aminotransferase (AST), Alkaline phosphatase (ALP), Creatine phosphokinase (CPK), Creatine kinase-MB (CK-MB), Erythrocyte *sedimentation rate*(*ESR*), C-Reactive Protein (CRP), Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Lactate dehydrogenase (LDH).

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