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Neurologic Involvement in COVID-19: A Diagnostic Challenge

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Abstract

The 2019 Coronavirus Disease (COVID-19) is a pandemic disease caused by severe acute respiratory syndrome coronavirus 2. Respiratory symptoms are the most common, however neurologic symptoms have been reported in more than a third of patients with this infection. The virus can take different pathways to involve the central nervous system, but the exact pathologic basis for this neurologic involvement is currently unknown. This paper describes the case of a 26-year-old female with COVID-19 who presented to the emergency department with spatial and temporal disorientation and slurred speech. The diagnosis of encephalitis was made and a status epilepticus was documented. Several etiologies had been investigated and the only finding was COVID-19. Brain magnetic resonance reveled periventricular white matter lesions compatible with demyelinating lesions, similar to other cases published with literature concerning COVID-19 patients.

Keywords: Encephalitis; Status epilepticus; SARS-CoV-2; Periventricular white matter lesion

Introduction

The 2019 Coronavirus Disease (COVID-19) is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and results in a diversity of symptoms [1]. Since first´s descriptions, it has become clear that neurologic involvement in COVID-19 is of importance [1,2]. This is evident when a third of patients with SARS-COV-2 developed neurological manifestations [3]. Evidence suggested potential neurologic manifestations, such as anosmia, ageusia, anorexia, myalgias, headache, dizziness, meningoencephalitis, altered consciousness, Guillain–Barré syndrome, syncope, seizure and stroke [2].

The pathophysiology of human coronaviruses, including SARS-CoV-2, provides information about potential processes causing neurological injury [1]. In humans, SARS-CoV-2 is thought to gain cellular access via cell receptor angiotensin-converting enzyme 2 (ACE2) and S protein priming via TMPRSS2 cell protease [1,4]. Co-expression of ACE2 and TMPRSS2 was found in nasal goblet and ciliated epithelial cells, as well as oligodendrocytes, by conducting cross-human tissue surveys of ACE2 and TMPRSS2 positive cells. Co-expression of ACE2/TMPRSS2 in oligodendrocytes could indicate central nervous system

infiltration or proliferation. SARS-CoV-2 has been clinically associated with cases of encephalitis and ischemic changes in neurons. In post-mortem brains, viral particles and genome sequences have been identified [1].

Case Presentation

In October of 2020, a 26-year-old female presented to the emergency department with slurred speech. She had a positive Polymerase Chain Reaction (PCR) for SARS-CoV-2 by the nasopharyngeal swab the day before and according to the family members her complaints started four hours prior to the admission. She denied fever, nausea, vomit, headache, syncope, tonicoclonic movements and respiratory symptoms. Her past medical history included obesity. At admission, she scored 14 points in Glasgow coma scale, due to disorientation and presented a slurred speech. She was hemodynamically stable and febrile, without any other remarkable feature on physical examination. Laboratory investigations in the emergency department had no abnormal findings (Table 1).

Table 1: Main laboratory test results in the emergency department.

Test Results		Reference Value
Hemoglobin (g/dL)	14,6	12,0 - 16,0
White blood cells	8,5 x10^3/µL	4,8 - 10,8 x 10^3/µL
Neutrophils	5,8 x 10^3/µL	1,8 - 7,7 x10^3/µL
Eosinophils	0,1 x 10^3/µL	0,0 - 0,49 x10^3/µL
Basophils	0,0 x 10^3/µL	0,0 - 0,1 x10^3/µL
Lymphocytes	1,9 x 10^3/µL	1,0 - 4,8 x10^3/µL
Monocytes	0,6 x 10^3/µL	0,12 - 0,8 x10^3/µL
Platelets	195 x 10^3/µL	150 - 350 x10^3/µL
C-reactive protein (mg/L)	<2,9	<3,0
Urea (mg/dL)	26	74 - 106
Creatinine (mg/dL)	0,81	0,57 - 1,11
Sodium (mEq/L)	140	135 - 146
Potassium (mEq/L)	3,86	3,5 - 5,1
Lactate dehydrogenase (UI/L)	149	84 - 246
Total bilirubin (mg/dL)	0,69	0,2 - 1,0
Asparte aminotransferase (UI/L)	7	15 - 37
Alanine aminotransferase UI/L)	25	30-65

Toxic screening was negative. Head computed tomography and a chest radiograph were normal. At this point, a lumbar puncture was performed. Cerebrospinal fluid (CSF) was clear with opening pressure was 12cm H_2O. The adjusted CSF white blood cell count in the presence of red blood cells was 5mcL with a protein range high of 77,5mg/dL with normal glucose value. She was admitted to the Internal Medicine Department with the diagnosis of encephalitis, for additional study and treatment. The patient was medicated with acyclovir 10mg/Kg/24h considering the diagnosis suspicion.

During hospitalization, meningitis/encephalitis panel (whitch tests CSF for the 14 most common pathogens responsible for community acquired meningitis or encephalitis including viruses, bacteria and yeast) was negative. The CSF´s PCR for SARS-CoV-2 was negative. Electroencephalography showed a diffusely slowed tracing with frequent paroxysmal activity with bilateral frontotemporal slow wave spike pattern that may correspond to a status epilepticus. Antiepileptic therapy with levetiracetam and steroid treatment with dexamethasone was started on the second day with a progressive recovery within 24 hours to a Glasgow coma scale of 15 points. At day 3, MRI revealed changes of the periventricular white matter with an unspecific focal lesion adjacent to the body of the left lateral ventricle, without restriction of diffusion nor contrast enhancement (Figure 1).

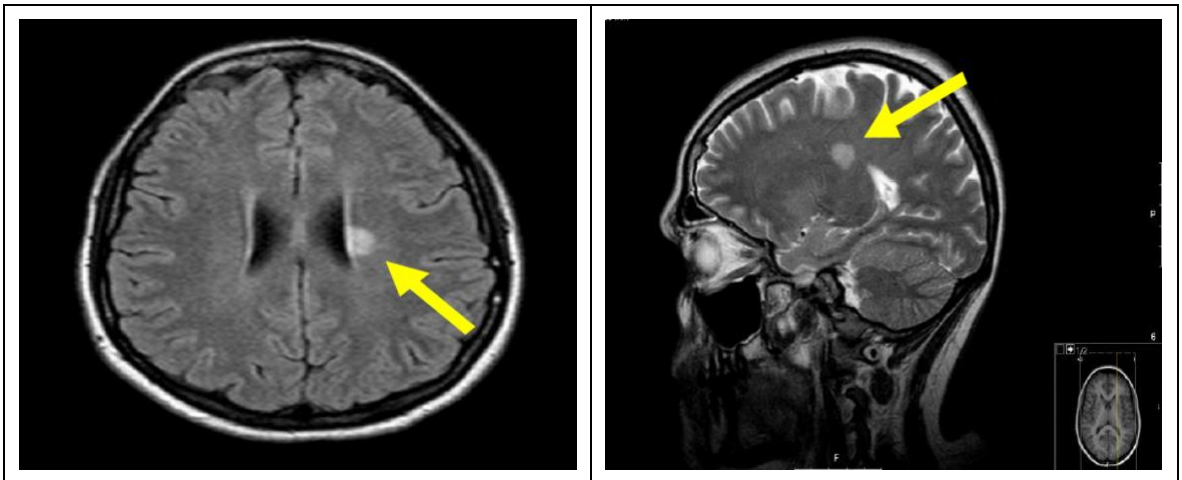

Figure 1: Brain MRI with periventricular white matter lesion.

Inflammatory and coagulation panels showed normal results. Positive IgG and negative IgM was detected for Epstein–Barr virus, cytomegalovirus and herpes simplex virus. Hepatitis B, C, HIV and syphilis were negative. Serum analysis for autoantibodies was positive for antinuclear homogeneous antibodies having a titer of 1:160. Remaining autoimmunity tests were negative.

She completed a 10-day acyclovir course and corticosteroid withdrawal was initiated five days after admission.

On day 10, a third control electroencephalography did not show paroxysmal activity and a second brain MRI showed two small lesions, compared to the previous one. These lesions were hyperintense in long TR and in T2-Flair located in the anterior left periventricular white matter, being identical to the largest left posterior lesion, measuring 13 mm in diameter. These can be demyelinating lesions of inflammatory etiology (Figure 2).

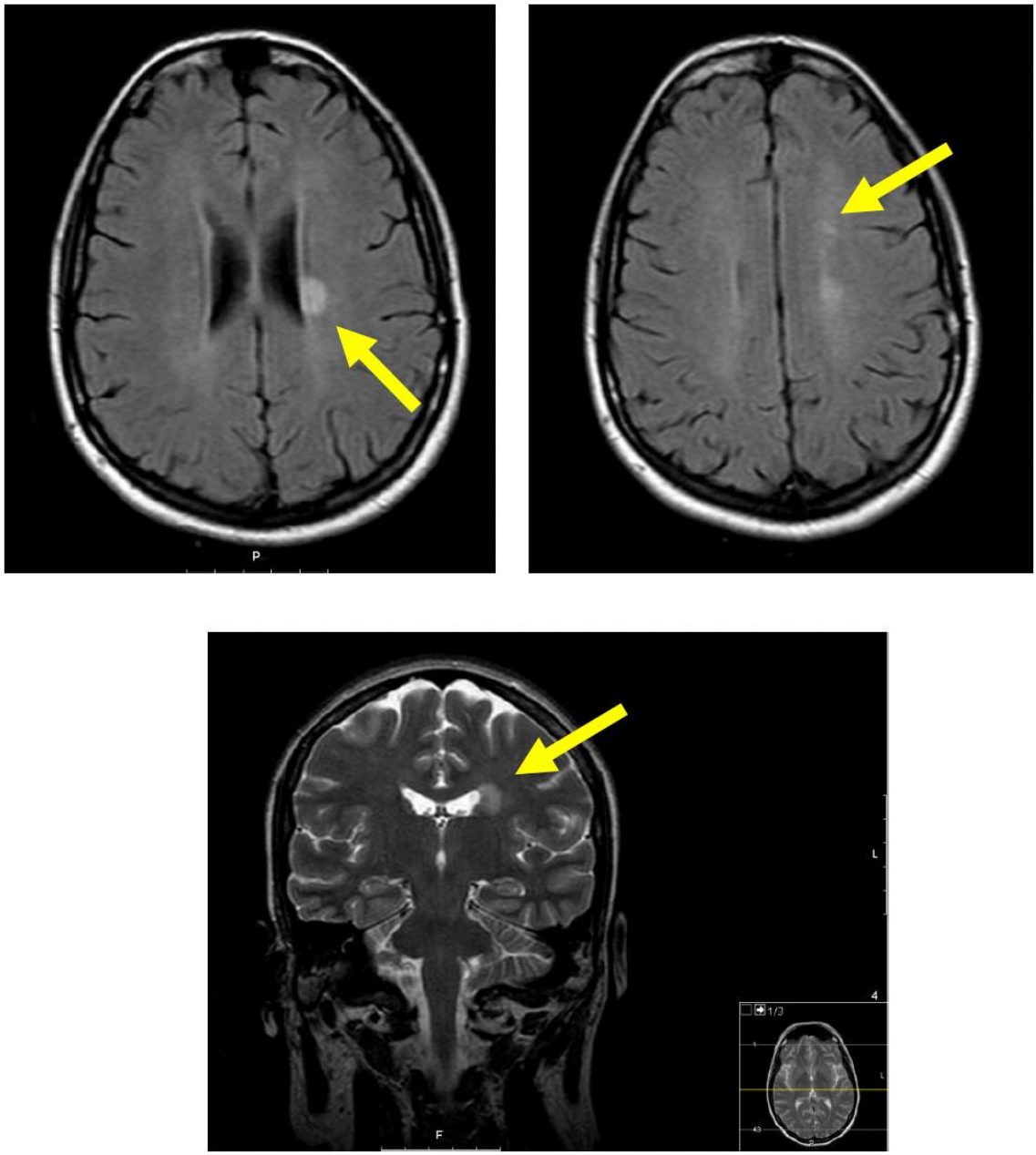

Figure 2: Second brain MRI with periventricular white matter lesion.

After 12 days, the patient was discharge asymptomatic, medicated with levetiracetam and a corticosteroid therapy weaning plan.

Three months later, in follow-up medical consultation, she remained asymptomatic without remarkable feature on physical examination. A lumbar puncture was repeated, with normal CSF analysis, without oligoclonal bands or intrathecal IgG syntheses and normal CSF/serum-albumin ratio. Brain MRI 4 months after hospital discharge was similar, without previous lesions evolution and with no new cerebral or medullar lesions.

After two years follow-up, the patient remains asymptomatic, without any other similar episode and a normal physical examination.

Discussion

Although reports of cerebral manifestations are on the rise, COVID-19 more frequently manifests itself through respiratory-related symptoms and complications [5]. The ability to isolate SARS-CoV-2 from brain tissue that has been exposed to the virus raises the possibility that the virus can directly infect the CNS. Encephalopathy is a significant complication of SARS-CoV-2 infection [6]. Encephalopathy could manifest in a variety of ways, from altered behavior and a slight attention impairment to significantly compromised consciousness [7]. Acute viral encephalitis, acute disseminated encephalomyelitis, such as white matter lesions, anosmia, cerebrovascular disease and psychiatric symptoms (depression, anxiety and pain disorder) are all caused by a systemic immune response or cytokine storm known as COVID-19 associated encephalopathy [8].

For individuals with COVID19-related encephalopathy, early monitoring and prognostic adjustment are crucial. The use of imaging, early detection of inflammatory variables and prompt intervention on patients with neuropsychiatric sequelae can all significantly enhance patient prognosis during the acute stage of infection. Currently, immunization and antiviral medication therapy are the main clinical treatments for COVID-19 [8].

Due to the paucity of understanding of the changes brought on by the SARS-CoV-2, specifically neurologic changes, the diagnosis and determination of the etiology in this case report were challenging. The low sensibility of the technique to detect this virus in CSF is another recognized fact [9].

Conclusion

Encephalitis and status epilepticus are diagnostic challenges and the delayed in the diagnostic could have unintended consequences. The neurologic involvement of COVID-19 remains a challenge with long-term complications still unknown. The debate regarding the best treatment options and prognosis is still open, while more studies keep being published.

REFERENCES

1. Aghagoli G, Marin B, Katchur N, et al. Neurological Involvement in COVID-19 and Potential Mechanisms: A Review. Neurocrit Care. 2021; 34: 1062-1071.
2. Wang Y, Wang Y, Huo L, et al. SARS-CoV-2-associated Acute Disseminated Encephalomyelitis: A Systematic Review of the Literature. Journal of Neurology. 2022; 269: 1071-1092.
3. Mao L, Jin H, Wang M, et al. Neurologic Manifestations of Hospitalized Patients with Coronavirus Disease 2019 in Wuhan, China. JAMA Neurology. 2020; 77: 683-690.
4. Zheng K, Feng G, Liu W, et al. Extrapulmonary complications of COVID-19: A Multisystem Disease? Journal of Medical Virology. 2021; 93: 323-335.
5. Sriwastava S, Tandon M, Podury S, et al. COVID-19 and Neuroinfammation: A Literature Review of Relevant Neuroimaging and CSF Markers in Central Nervous System Infammatory Disorders from SARS-COV2. Journal of Neurology. 2021; 268: 4448-4478.
6. Reichard R, Kashani K, Boire N, et al. Neuropathology of COVID-19: A Spectrum of Vascular and Acute Disseminated Encephalomyelitis (ADEM)-like Pathology. Acta Neuropathologica. 2020; 140: 1-6.
7. Tuma R, Guedes B, Carra R, et al. Clinical, Cerebrospinal Fluid and Neuroimaging Findings in COVID-Encephalopathy: A Case Series. Neurological Sciences. 2021; 42: 479-489.

8. Huang Y, Ling Q, Manyande A, et al. Brain Imaging Changes in Patients Recovered From COVID-19: A Narrative Review. Frontiers Neuroscience. 2022; 16: 855-868.
9. Zanin L, Saraceno G, Panciani P, et al. SARS-CoV-2 can Induce Brain and Spine Demyelinating Lesions. Acta Neurochirurgica (Wien). 2020; 162: 1491-1494.