

Case Report

New-Onset Seizure Post-Testing Positive for Sars-Cov-2 Virus**Seyed Mohammad Nahidi^{1,2,*} BSc, Jose Isaac Reyes¹ BSc, Tucker Ledo¹ BSc, Leonidha Duka² MD, Steven Smith² MD**¹Medical Student, St George's University, Grenada, West Indies²Wyckoff Heights Medical Center, Brooklyn, USA***Corresponding author:** Seyed Mohammad Nahidi, Medical Student, Wyckoff Heights Medical Center 374 Stockholm Street, Room C-408, Brooklyn, NY 11237, USA

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Abstract

The SARS-CoV-2 virus has taken the world by storm and has caused a multitude of sequelae for several of the patients who have tested positive for it. While many symptoms can be seemingly expected to originate from the virus, a wide majority of them have yet to be fully elucidated. Among such conditions, there have been associations made between SARS-CoV-2 and new-onset seizures. Seizures can be a frightening manifestation of COVID-19 for those patients who have tested positive. Despite being a rare occurrence, there has been a selected number of reports of patients experiencing new-onset seizures after being tested positive for the novel coronavirus. We present a case of a patient who had recently been tested positive for SARS-CoV-2 virus, and experienced his first seizure shortly after.

Keywords: SARS-CoV-2; Seizure; Vaccine; Cocaine; Covid-19

Introduction

Seizures are defined as uncontrollable electrical activity of the brain, leading to symptoms such as myoclonus, loss of consciousness, bowel/urinary incontinence, tongue and cheek biting. There are numerous etiologies that can lead to a seizure, and so when diagnosing this condition, it is imperative to narrow down the possible differentials. Since the beginning of its insurgence in late 2019 the novel coronavirus has been a global concern. Although SARS-CoV-2 has been associated primarily with respiratory symptoms, there are a wide variety of other extrapulmonary symptoms. We present a case where the patient experienced his first seizure a few days after testing positive for SARS-CoV-2. Various hypotheses have been proposed to explain how SARS-CoV-2 can trigger a seizure. Due to the paucity of data around the underlying mechanism of COVID-19- induced seizures, more extensive research may be required to obtain conclusive evidence.

Case Report

A 61-year-old obese male, with a past medical history significant of ethanol abuse, was brought by EMS to our institution for an unwitnessed fall/syncopal episode. His wife heard the patient fall and found him on the floor. She stated that the patient had jerking movements, clenched fists, body stiffening, urinary incontinence, and cheek biting. The wife stated that the episode occurred while the patient was having his third beer. The patient claims that he drinks about 3-6 beers a day. The patient did not recall the episode but remembered waking up on the floor and seeing his wife standing over him. He stated that he received his first dose of the SARS-CoV-2 vaccine two

weeks ago; however, tested positive for SARS-CoV-2 on this admission. The patient denied any malaise, cough, chest pain, dyspnea, fever, and changes in bowel movement.

Vital signs were significant with a blood pressure of 142/78 mmHg. The patient's physical exam was unremarkable. The patient was pancytopenic with a low WBC (2.67 K/UL), RBC (10.0 G/DL), and platelet (66 K/UL). His d-dimer level was elevated to 632, while his ferritin and serum iron levels were reduced; 7 NG/ML and 37 UG/DL respectively. His troponin was negative. Folic acid and B12 levels were within the normal limits. HIV test was negative. The patient's alcohol level was 37 mg/dl and urine toxicology were positive for cocaine.

The patient's chest X-ray did not identify any acute cardiopulmonary disease but identified a calcified granuloma in the periphery of the right lung. The patient's CT scan of the head without contrast and echocardiogram was unremarkable.

The neurology specialist was consulted and an EEG was recommended. The EEG was unremarkable. The patient was placed on Ativan 2 mg as needed and Keppra 1 gram BID.

Upon discharge, the patient was asymptomatic and hemodynamically stable. An outpatient MRI appointment was made. The patient missed his MRI appointment and his follow-up.

Discussion

Seizures occur when there is an uncontrollable electrical activity in the neurons, leading to changes in muscle activity, behavior, sensation, and level of consciousness. A myriad of different etiologies could trigger a seizure such as alcohol withdrawal, substance abuse, high fever, electrolyte abnormalities, infections, and other causes. It is crucial to identify the source of the

seizure so it can be treated before it can cause permanent neural damage to the patient. However, there has been an increase in the incidence of possible covid induced seizures.

Although the mechanism is not fully understood, there are cases of covid induced seizures reported [1-4]. A few proposed models of the pathophysiology of SARS-CoV-2 induced seizures have been proposed. A proposed mechanism states that the virus invasion triggers the microglial inflammatory cascade that will release cytokines such as IL-1b, IL-6, TNF α among others that could propagate inflammation and then seizure [5]. Another working hypothesis is that the SARS-CoV-2 virus can disrupt the blood-brain barrier, thereby affecting homeostasis in the CNS which could also result in the peripheral cytokines entering the brain thereby causing febrile seizures [5]. The SARS-CoV-2 virus has an affinity for cells that express ACE2 receptors such as glial cells and neurons [2].

Further, vaccines have been linked to the onset of seizures [6]. In this case, the patient had recently received his SARS-CoV-2 vaccine. The lack of literature available on the association between the SARS-CoV-2 vaccine and seizure made it difficult to associate the onset of the seizure to the vaccine. However, there have been cases reported where patients suffered from a seizure after receiving the SARS-CoV-2 vaccine [7].

Given the history of alcohol abuse, alcohol withdrawal is a well-known trigger of seizures. Likewise, when a person consumes alcohol the seizure threshold is increased and it declines about 6-8 hours after the patient has his last alcoholic drink [8]. In the toxicology report, it was also noted that the patient tested positive for cocaine which can also be an independent trigger for seizures, and a few different biochemical mechanisms have been established. Cocaine acts to promote a catecholaminergic state by blocking enzymes that remove these substances from neurons and increases serotonin content in nerve synapses [9]. Furthermore, cocaine has membrane-stabilizing properties which synergistically act with endogenous substances responsible for convulsions [9]. One study, in particular, suggested that cocaine consumption could lead to focal cerebral ischemia, culminating in seizures [10]. The constellation of these biochemical effects renders cocaine and its ability to cause seizures, many of which have been noted to be tonic-clonic [9]. Majlesi et al pointed out that while single substantial cocaine infusions can induce status epilepticus, most seizures associated with cocaine follow a "kindling" model, wherein multiple sub-convulsive infusions of cocaine eventually reach a seizure threshold [11]. Koppel and colleagues conducted a retrospective study, concluding that cocaine exacerbated convulsion thresholds in patients who were seemingly predisposed to have seizures, secondary to certain comorbidities [12].

While it is still difficult to pinpoint a definite source of seizure to be the covid-19 virus, it is still one of the important differentials as SARS-CoV-2 is not fully understood. It is known that the SARS-CoV-2 virus affects multiple organs [13,14]. The Angiotensin-converting-enzyme 2 receptors are expressed on many cells across the human body. Therefore, extrapulmonary symptoms and associations such as dysfunctions in the myocardium, gastrointestinal tract, renal system, hepatic and neurological systems must be considered [14].

Our case conveys a 61-year-old male experiencing his first seizure. Although he has a history of alcohol abuse and his urine tested positive for cocaine, the patient was actively drinking when he experienced his first seizure. The only potential causes of his seizure may be due to him being positive for the SARS-CoV-2 virus. Although further investigation is warranted, we

find it very plausible that the reason for our patient's seizure was due to his underlying infection with the SARS-CoV-2 virus.

Conclusion

Several mechanisms have been proposed to elucidate how the SARS-CoV-2 virus can eventually lead to a seizure. For such case presentations, it is imperative to find the neurotropism and its triggers, in order to establish an adequate plan of care and to further prevent recurrence in the future. Our patient had established risk factors such as cocaine and alcohol abuse, therefore SARS-CoV-2 may serve as an additive to reduce the seizure threshold. As a more increased number of SARS-CoV-2-induced seizures have been reported, more extensive research is warranted. A patient with a new-onset seizure after being tested positive for the SARS-CoV-2 virus requires further investigation and treatment.

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