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COVID-19 associated encephalopathy

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ABSTRACT

Background. COVID-19 is a virus that affects the respiratory system most commonly. However, cases of widespread effects of COVID-19 on the human body have been emerging. During our search, we found that COVID-19 associated encephalitis has been reported in literature as a severe complication of COVID-19 infection.

Case report. We report a case of COVID-19 associated encephalitis. Our patient had extensive inpatient morbidity because of this illness.

Conclusions. We believe that COVID-19 associated encephalitis is a condition with high mortality and very limited data about risk factors, diagnosis and treatment, and, as such, more studies are needed to enhance medical knowledge regarding this disease.

Keywords: COVID-19, COVID-19 associated encephalitis

Abbreviations (in alphabetical order):

CT – Computed Tomography
MRI – Magnetic Resonance Imaging

CASE REPORT

An 81-year-old-male, with a past medical history of diabetes, prior right idle cerebral stroke and right sided carotid stenosis status post carotid endarterectomy presented to our hospital from home after he was found to be unresponsive by his family. He had tested positive for COVID-19 two days prior.

When he was brought to the emergency room, neuroimaging with computed tomography (CT) of the head was negative for acute findings, he had to be intubated to protect his airway, and for COVID-19 he received remdesivir and steroids. His pertinent labs are shown in Table 1.

The barrier to extubating was encephalopathy. His encephalopathy was attributed initially to hypoxia vs sepsis. However, when all other causes were treated, sedatives were turned off, and still, he failed to regain consciousness, neurology was involved in care and the CT head scan was repeated, which was again negative for acute findings (Figure 1).

TABLE 1. Pertinent labs

Parameter	Ref value	Value
ESR	0-20 mm/hour	65
CRP	0-10 mg/l	102.7 mg/l
LDH	12-246 u/l	406
Ferritin	30-322 ng/ml	406
Procalcitonin	0-1.99 ng/ml	0.24
Ammonia	8-32 micro mol/ l	13

Electroencephalogram was obtained and it showed no epileptiform activity but revealed generalized slowing consistent with encephalopathy. Magnetic resonance imaging (MRI) of the brain (Figure 2) showed cortical T2/FLAIR hyperintense signal in the left temporal, parietal, and occipital lobes, as well as the right occipital lobe with associated cortical enhancement, suggesting possibly viral encephalitis.

Lumbar puncture was performed which showed lymphocytic pleocytosis (Table 2). Meningitis/Encephalitis panel, paraneoplastic antibodies were neg-

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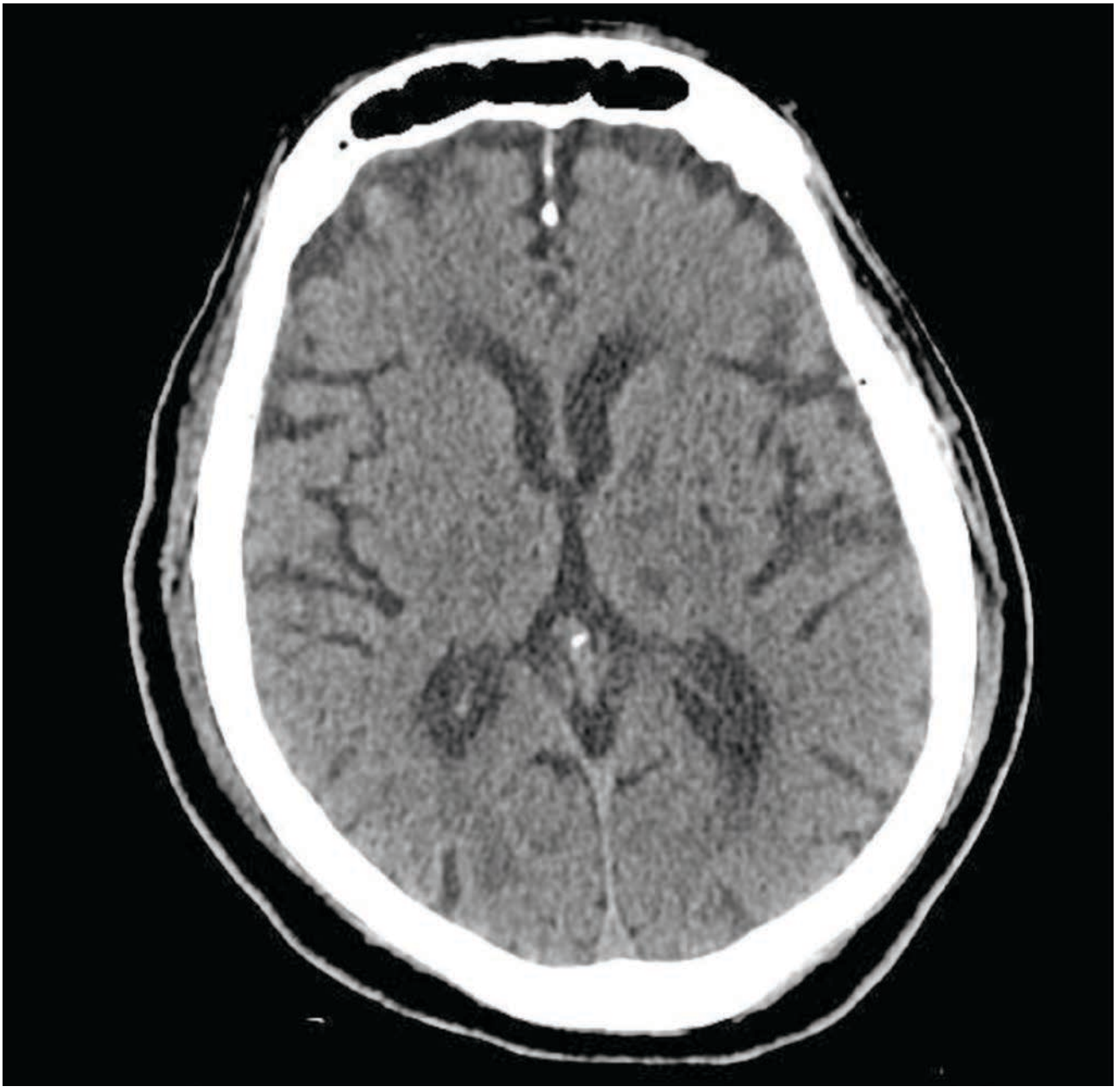

FIGURE 1. CT scan without acute findings

TABLE 2. Cerebrospinal fluid analysis

CSF Parameter	Ref value	Value	CSF Parameter	Reference	Value
Appearance		Clear & Colorless	Protein	15-45 mg/dl	40 mg/dl
RBC	0/ micro l	74/ micro l	Glucose	40-70 mg/dl	117 mg/dl
Nucleated cells	0-6/ micro l	12/ micro l	Oligoclonal bands		Neg
Polys	0-6 %	3 %	Paraneoplastic Ab		Neg
Lymphocytes	40-80 %	90 %	Encephalitis/ Meningitis panel		Neg
Mononuclear	15-45 %	7 %			

ative. Lumbar puncture results were consistent with post-viral/ auto-immune encephalitis. He was diagnosed with a case of COVID-19 encephalopathy and completed 5 days of intravenous immunoglobulins.

MRI of the brain (Figure 3) was repeated after the intravenous immunoglobulins and showed Gyriform edema and enhancement in the left temporal, parietal lobes and bilateral occipital lobes, decreased compared to prior exam. There was an increased T1 signal indicating mineralization of bilateral lentiform nuclei. This further confirmed an evolving COVID-19 encephalopathy.

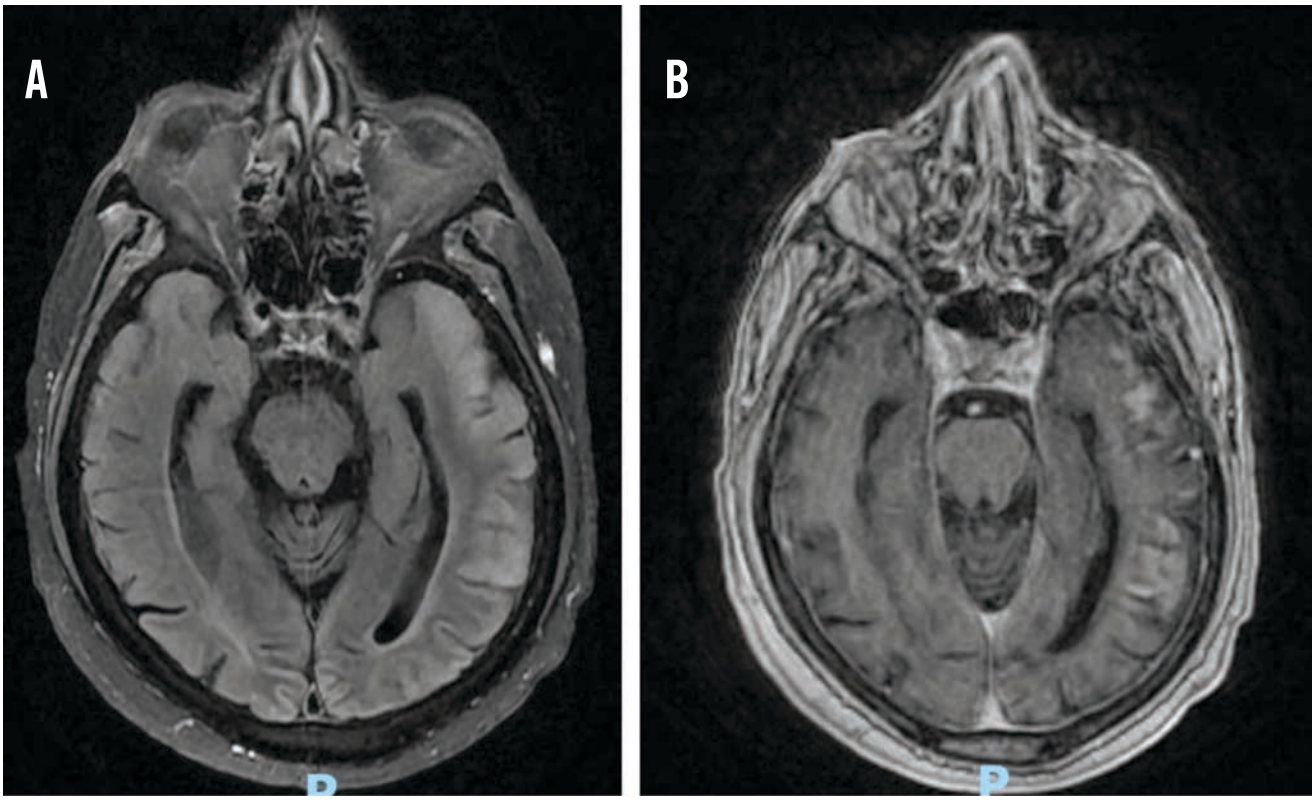

FIGURE 2. A - Cortical T2/FLAIR hyperintense signal in the left temporal, parietal, and occipital lobes; B - associated cortical enhancement in these regions

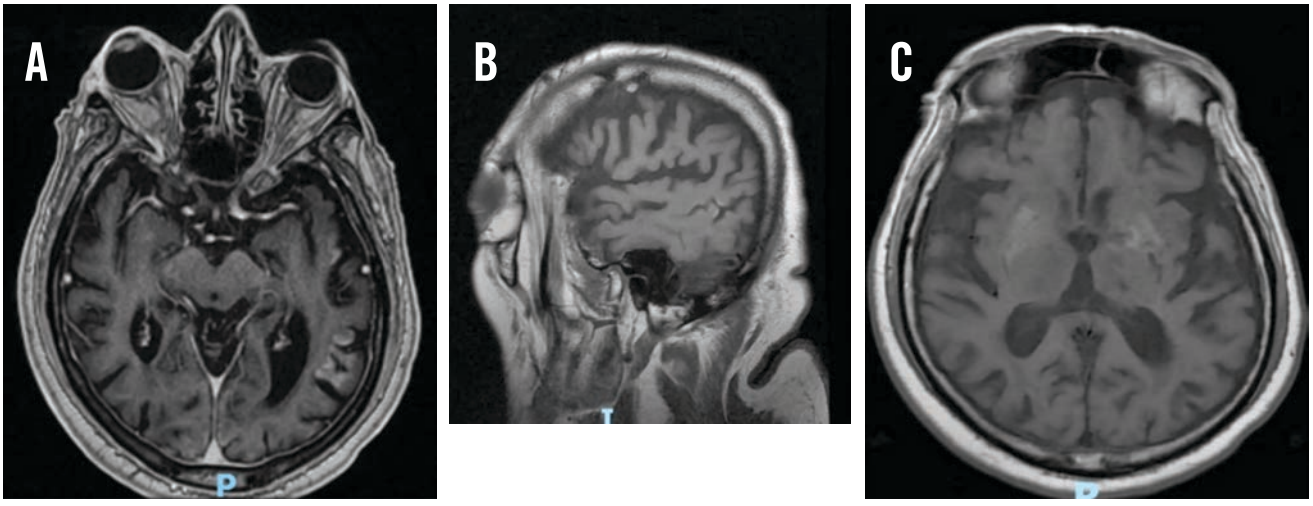

FIGURE 3. Gyriform increased FLAIR signal intensity indicating edema in the left temporal lobe, parietal lobes and bilateral occipital lobes associated with enhancement. A - Compared to the prior exam edema/FLAIR signal has decreased enhancement is also less conspicuous; B - There is cortical laminar necrosis in the left posterior temporal lobe; C - Increased T1 signal intensity in bilateral lentiform nuclei, more prominent compared to the prior exam

Since the patient has multiple other comorbidities, at the time of writing this article, he remains in the hospital in a vegetative state.

DISCUSSION

COVID-19 is a virus that the most commonly affects the respiratory system. However, cases of widespread effects of COVID-19 on the human body have been emerging. During our search, we found that COVID-19 associated encephalitis has been reported in literature as a severe complication of COVID-19 infection. Siow I et al. [1] reported the incidence of encephalitis as a complication of COVID-19 to be 0.215% (95% CI = 0.056% - 0.441%). As this is a rare condition, not many studies have been done to find the risk factors associated with this complication of COVID-19 infection. Our research showed that most of the deleterious effects associated with COVID-19 are mediated through immune damage

due to cytokine storm [2]. Similarly, COVID-19 associated encephalopathy is usually mediated through either direct toxic effects of the virus, molecular mimicry or a similar immunological process [1,2].

Diagnosis of this encephalitis is difficult due to only a transient dissemination of the virus in CSF which precludes its detection. Based on World Health Organization (WHO) definition, positive testing for COVID-19 along with exclusion of etiology of encephalitis is enough to diagnose a patient with COVID-19 encephalitis [3]. MRI brain scan plays a helpful role in the diagnosis. Diverse findings have been associated with this form of encephalitis. Most common are hemorrhagic lesions on fluid-attenuated inversion recovery and T2 sequences, and diffuse white matter hyperintensities [4,5]. Our patient had an MRI with cortical T2/FLAIR hyperintense signal in the left temporal, parietal, and occipital lobes, as well as the right occipital lobe with associated cortical enhancement during the initial phase of his encephalitis and Gyriform edema and enhancement in left temporal, parietal lobes and bilateral occipital lobes, as well as increased T1 signal indicating mineralization of bilateral lentiform nuclei later.

Several case reports have reported various treatment modalities with various degrees of success. These include steroids, intravenous immunoglobulins, plasmapheresis, rituximab or a combination of these [6-8,3]. Our patient received Dexamethasone 6 mg for 10 days for the initial COVID-19 associated acute respiratory distress and then intravenous immunoglobulins later for encephalitis. However, our patient remains severely encephalopathic at the time of writing this article. The mortality associated with COVID-19 encephalitis remains high. Siow I et al report a a mortality of 13.4% when COVID-19 is complicated by encephalitis as compared to the 3.4% in uncomplicated COVID-19 patients [1].

CONCLUSION

COVID-19 associated encephalitis is being increasingly reported. It is a condition with high mortality and very limited data about risk factors, diagnosis and treatment. As such more studies are needed to enhance medical knowledge regarding this disease.

Patient consent:
No patient identifying data

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Data collection - Zauraiz Anjum;
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