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Clinical letter

Seizure with CSF lymphocytosis as a presenting feature of COVID-19 in an otherwise healthy young man

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ARTICLE INFO

Keywords:

COVID-19

Seizure

Epilepsy

A 20-year old previously well man was brought to hospital following a seizure. For three days he had complained of myalgia, lethargy and fever. On attempting to get out of bed at home, he had experienced lightheadedness with blurred and double vision and felt his legs were too weak to allow him walk. He then had a generalised tonic-clonic seizure, which lasted one minute. In the wake of the seizure he was confused and aggressive, requiring intravenous midazolam in the emergency department. He was febrile (101.3 F) with heart rate 85bpm, respiratory rate 12, and sO₂ 97 % on room air. Respiratory examination was normal. His confusion resolved within six hours with no deficits and a normal neurological examination. He was isolated and treated with levetiracetam, aciclovir, ceftriaxone and vancomycin for possible central nervous system (CNS) infection. There was no prior history of seizures or epilepsy; psychomotor delay; head injury or CNS infection and no history of recent travel.

A nasopharyngeal swab for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and influenza was negative and isolation precautions were discontinued. Routine blood tests were largely unremarkable (Table 1). Chest x-ray was normal. A CT brain and MRI brain were unremarkable, apart from mild mucosal thickening noted in the sphenoid sinus. CSF analysis demonstrated a lymphocytic pleocytosis (21 cells/mm³, 99 % mononuclear, 1% polymorphs) with normal protein and glucose (Table 1). CSF culture demonstrated no growth and PCR for herpes simplex virus, varicella zoster virus, and enterovirus was negative. Within two days of his admission, the patient's wife developed respiratory symptoms and tested positive for SARS-CoV-2 at

another hospital. The patient was isolated again and a repeat nasopharyngeal swab for SARS-CoV-2 was positive. CSF PCR for SARS-CoV-2 was negative. The patient remained well and was discharged home. EEG, performed on outpatient follow-up for infection control reasons, was normal.

Neurological symptoms occurring in the context of COVID-19 are not uncommon, Mao et al. reported a rate of 36.4% (78/214). Neurological symptoms were more common among those who were systemically unwell (45.5 %, 40/88) and may be secondary to sepsis and organ dysfunction. [1] Coronaviruses have the potential to invade the CNS. Possible routes include haematogenous or lymphatic spread or neural invasion with retrograde transport. [2] A case of acute necrotising encephalitis related to COVID-19 has been reported [1,3]. Although CSF lymphocytosis may occur in unprovoked seizures, in this case the viral prodrome and identification of an infectious agent argues against this as a sole cause of pleocytosis [4]. Our case helps confirm that COVID-19 may involve the CNS, potentially causing a meningoencephalitis. In our patient the lack of obvious respiratory involvement, the overall mild clinical course, and the initial falsely negative nasopharyngeal swab testing were all noteworthy features.

Declaration of Competing Interest

None to declare.

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Received 3 June 2020; Accepted 5 June 2020

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Table 1
Clinical Laboratory Results.

| Variable | Reference Range | Value |
|---|-----------------|--------|
| Haemoglobin (g/dL) | 13.0–18.0 | 16.2 |
| Haematocrit (%) | 0.400–0.500 | 0.455 |
| White cell count (x10 ⁹ /LL) | 3.50–11.00 | 12.02* |
| Neutrophils (x10 ⁹ /L) | 2.00–8.00 | 7.83 |
| Lymphocytes (x10 ⁹ /L) | 1.00–4.00 | 3.07 |
| Platelets (x10 ⁹ /L) | 150–400 | 210 |
| Sodium (mmol/liter) | 133–146 | 138 |
| Potassium (mmol/liter) | 3.3–5.0 | 3.8 |
| Chloride (mmol/liter) | 95–108 | 103 |
| Carbon dioxide (mmol/liter) | 22–29 | 25 |
| Urea (mmol/liter) | 2.8–8.6 | 5.4 |
| Creatinine (umol/liter) | 65–107 | 81 |
| C- reactive protein (mg/liter) | < 7 | 4 |
| Glucose (mmol/L) | 3.7–6.0 | 5.7 |
| D-dimer (mg/L) | 0.00–0.50 | 0.35 |
| Ferritin (ug/l) | 22–275 | 281* |
| Albumin (g/L) | 35–50 | 45 |
| Alanine transferase (iu/L) | 0–55 | 356* |
| Alkaline Phosphatase (iu/L) | 30–130 | 73 |
| Anion gap (mmol/L) | 10–16 | 10 |
| CSF | | |
| Red cells | 0 | 22 |
| White cells | 0–4 | 21 |
| Protein (mg/L) | 150–450 | 404 |
| Glucose (mmol/L) | | 3.2 |

* The value in the patient was above the normal range.

References

[1] Mao L, Wang M, Chen S, et al. Neurological manifestations of hospitalized patients

with COVID-19 in Wuhan, China: a retrospective case series study. SSRN Electron J 2020.

- [2] Baig AM, Khaleeq A, Ali U, et al. Evidence of the COVID-19 virus targeting the CNS: tissue distribution, host-virus interaction, and proposed neurotropic mechanisms. *ACS Chem Neurosci* 2020;11(7):995–8.
- [3] Poyiadji N, Shahin G, Noujaim D, et al. COVID-19–associated acute hemorrhagic necrotizing encephalopathy: CT and MRI features. *Radiology* 2020. Mar 31:201187.
- [4] Tamani H, Jobs C, Brettschneider J, Hoppner AC, Kerling F, Fauser S. Effect of epileptic seizures on the cerebrospinal fluid—A systematic retrospective analysis. *Epilepsy Res* 2015;114:23–31.