

CASE REPORT

Cognitive impairment in a patient with COVID-19 on hemodialysis: Too dangerous to neglect!

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Abstract

Neurological manifestations of coronavirus disease 2019 (COVID-19) often have tragic repercussions. Although many reports of neurological complications of severe acute respiratory syndrome coronavirus 2 infection exist, none of them are of patients on hemodialysis, who have a fivefold greater risk of stroke than the general population. In this report, we emphasize the importance of being vigilant for mild stroke in high risk populations—such as patients on hemodialysis—with COVID-19, since these conditions have overlapping symptoms.

KEYWORDS

cognitive impairment, COVID-19, encephalopathy, hemodialysis, ischemic stroke

INTRODUCTION

According to the World Health Organization, as of October 25, 2020, over 42 million people have been infected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) worldwide, with over 1.1 million deaths.¹ SARS-CoV-2 is primarily transmitted between people through respiratory droplets. The symptoms of SARS-CoV-2 infection range from cough and fever to severe respiratory diseases such as pneumonia or acute respiratory distress syndrome.

Severe neurological complications such as stroke, seizures, or encephalopathy may occur in patients with coronavirus disease 2019 (COVID-19) who have severe respiratory involvement. Additionally, mild neurological symptoms such as memory impairment, attention deficits, and lethargy have been associated with SARS-CoV-2 infection. Moreover, neurological manifestations of COVID-19 range from dizziness, hyposmia, hypogeusia, and headache to Guillain-Barre syndrome, ataxia, seizures, encephalopathy, encephalitis, and stroke.²

According to Mao et al., out of 214 hospitalized patients with COVID-19, 36% developed neurological symptoms, ranging from headache and hyposmia to stroke; stroke occurred in five patients, only one of whom survived.³ Chachkhiani et al. reported that 29% of 250 patients developed altered mental state (AMS) during hospitalization and 8% developed headache. They found that AMS and headache were the most prevalent neurological features.⁴

AMS has been associated with higher risks of hospitalization, intubation, death, post-illness cognitive impairment, and chronic sequelae.^{4–6} However, the precise cause of these complications in patients with COVID-19 is unclear.

Stroke occurs more frequently in patients with COVID-19 (5/214 patients) than in the general population (5/100,000 individuals).⁷ Unexpectedly, the global incidence of stroke has decreased since March 2020 due to missed diagnosis of milder strokes.⁸

Herein, we report on a patient on hemodialysis who experienced AMS during hospitalization. He was

diagnosed with COVID-19 with mild lung involvement and experienced ischemic stroke. He had cognitive sequelae on discharge from the hospital.

CASE REPORT

On August 31, 2020, a 55-year-old man of African origin presented to the emergency room with nausea, vomiting, loss of appetite, fatigue, vertigo, and myalgia. He was subsequently admitted. The patient had chronic terminal renal failure of unknown origin (probably secondary to hypertension and type 2 diabetes), and was on ambulatory hemodialysis since 2018. He also had renal anemia and secondary hyperparathyroidism. He did not smoke or drink alcohol.

On admission, his blood pressure was 100/60 mmHg, his blood hemoglobin level was 8.9 g/dl (normal value [VN]: 13–18 g/dl), lymphocyte count was $0.64 \times 10^3/\mu\text{l}$ (VN: $1.20\text{--}3.50 \times 10^3/\mu\text{l}$), C-reactive protein level was 35 mg/L (VN: <0.5 mg/L), and potassium level was 5.5 mmol/L (VN: 3.5–4.5 mmol/L). He tested positive for SARS-CoV-2 infection on nasopharyngeal swab real-time polymerase chain reaction (PCR). Thoracic radiography showed no lung condensation, and lung computed tomography (CT) showed bilateral subpleural ground-glass opacities, which were typical of COVID-19, affecting approximately 15% of the lung parenchyma (Figure 1). Although our patient did not require supplemental oxygen, he remained hospitalized to undergo dialysis and to investigate the cause of his abdominal discomfort and fatigue. He underwent hemodialysis thrice a week during hospitalization.

During a dialysis session, he suddenly developed nausea and progressive apathy, which was noticed by the dialysis staff. Consequently, a neurologist was consulted.

The patient had a Glasgow Coma Scale score of 15/15 and a National Institutes of Health Stroke Scale score of 1/42. While he had slight, barely visible nasolabial fold flattening and bradyphrenia, he had no gait impairment, speech disorder, weakness, or dysmetria. His body temperature was 96.8 °F (36.5 °C), and he had an oxygen saturation of 98% on room air, a blood pressure of 104/70 mmHg, and a respiratory rate of 15 per minute. Laboratory test results showed an increased lymphocyte count ($0.96 \times 10^3/\mu\text{l}$), no signs of inflammation, and stable anemia. He had a persistently elevated D-dimer level (3335 ng/ml), which was double the value expected in the context of terminal renal failure. As advised by the neurologist, he underwent brain CT, which showed hypodense ischemic plaques extending from the lentiform nucleus to the anterior horn of the left lateral ventricle. Brain magnetic resonance imaging (MRI) showed zones with diffusion restriction in the bilateral corona radiata extending up to the semioval regions, suggesting deep-watershed-type lesions (Figure 2).

The patient was transferred first to the stroke unit and subsequently to the neurorehabilitation department. Electroencephalography (EEG) showed signs of moderate encephalopathy. Logopedic and neuropsychological examinations showed global slowness, increased cognitive processing time, decreased verbal output, hyper-salivation, memory impairment, and decreased attention. As part of the stroke workup, he underwent electrocardiography (ECG), Holter-ECG, carotid doppler ultrasound, transthoracic and transesophageal echocardiography, and thrombophilia assessment, all of which showed normal findings. Lumbar puncture results showed slight proteinorachia (0.50 g/L; VN: 0.15–0.45 g/L), a glucose level of 91 mg/dl (VN: 45–80 mg/dl), and lymphocytes comprising 48% of all nucleated cells. Cerebrospinal fluid PCR was negative for SARS-CoV-2.

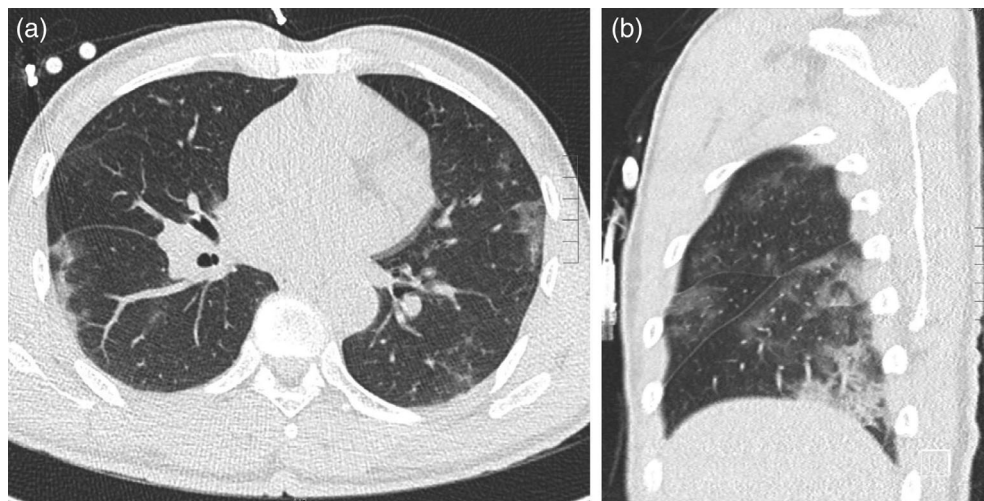


FIGURE 1 Chest computed tomography images in axial (a) and sagittal (b) views showing multilobar, symmetric, ground glass opacities, and lobular consolidations in the lung periphery

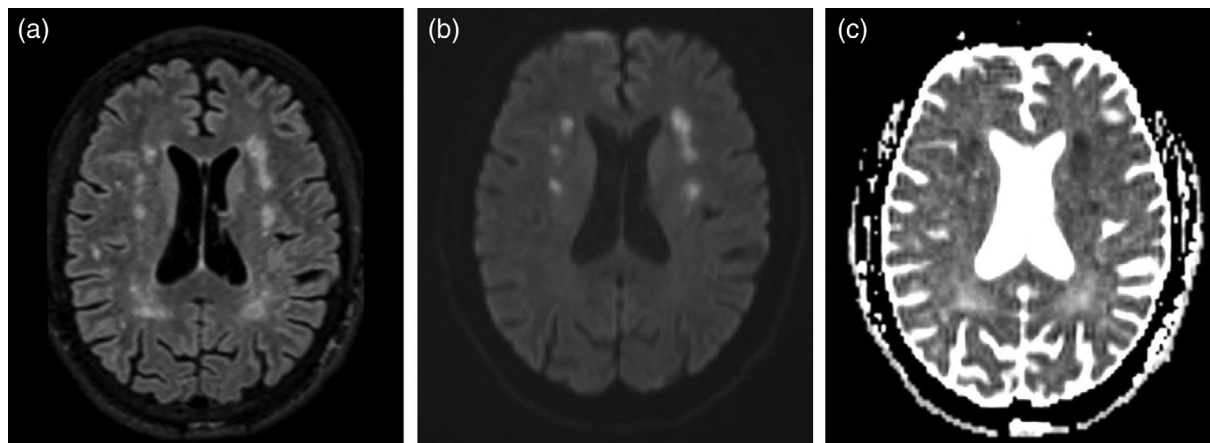


FIGURE 2 Axial fluid-attenuated inversion recovery (FLAIR) magnetic resonance image (a), axial diffusion-weighted image (b) and apparent diffusion coefficient map (c) of the brain. Bilateral multiple, small, symmetric FLAIR hyperintensities (a) that are linearly oriented parallel to the lateral ventricles in the corona radiata showing diffusion restriction (b–c), indicating deep watershed infarcts

The patient was discharged from the hospital after 37 days, 21 of which he spent in the neurology department. His decreased attention, memory impairment, and global slowness persisted at discharge. Hemodialysis and neurological follow-up on an ambulatory basis has been planned.

DISCUSSION

Although stroke is a known complication that occurs in approximately 2.5% of patients with COVID-19, the global incidence of stroke has decreased since March 2020. This is due to cases of mild stroke being overlooked and cases of severe stroke being reported almost exclusively in intensive care units,^{2,4,8,9} with the exception of rare single case reports.¹⁰ Reports exist on stroke in older adults, individuals with severe lung infection, and individuals with cardiovascular comorbidities. Additionally, AMS, mild encephalopathy, and headache have been reported to be the most common manifestations of COVID-19 in hospitalized patients.^{2–4,8}

COVID-19 increases stroke risk sevenfold in comparison with other conditions influenza.¹¹ Furthermore, the incidence of stroke in patients on chronic hemodialysis is 21/100,000,¹² which is five times more than that in the general population. In fact, the mortality rate due to stroke is 62.5% in patients on hemodialysis, as opposed to 30% in the general population.^{7,12} A recent study by Creput et al. showed that 19% of 200 patients on hemodialysis had been infected by SARS-CoV-2.¹³ However, there are no reports since March 2020 on the occurrence of cerebrovascular events in patients on hemodialysis.

Despite having a mild respiratory form of COVID-19 and initially being hospitalized for asthenia, nausea and

vomiting, and blood pressure medication adjustment, our patient experienced a silent stroke and encephalopathy secondary to his infection.

In patients with COVID-19, AMS is generally thought to occur due to hypoxemia and inflammation.⁸ The dialysis staff knew our patient since many years. Therefore, they were able to notice that he was less talkative than usual, something that may not be possible in a COVID-19 unit where families are forbidden to visit their infected relative.

Patients on hemodialysis have many comorbidities that are risk factors for stroke and severe respiratory manifestations of COVID-19. They are more fragile and susceptible to SARS-CoV-2 infection than the general population.

Our patient was discharged from the hospital with persistent memory impairment and decreased attention. Some articles describe cognitive impairment as a post-illness complication of SARS-CoV-2. A recent Chinese study reported impaired cognition in patients who were considered cured from COVID-19; they considered these symptoms to be due to inflammation.¹⁴

Preexisting neurological symptoms are observed in 14% of individuals presenting to emergency departments with SARS-CoV-2 infection. Furthermore, 34% of all hospitalized patients with COVID-19 develop neurological symptoms.⁴ The cognitive impairments reported in patients considered cured from COVID-19¹⁴ may have occurred secondary to silent stroke.

Our case report demonstrates that mild neurological signs may be wrongly attributed to inflammatory or hypoxic complications of SARS-CoV-2 infection and that post-COVID-19 cognitive impairments may be caused by major neurological events that could potentially lead to lifelong disabilities, loss of independence, reduced work capacity, and early-onset dementia.^{5,6}

CONCLUSION

Patients with behavioral changes, altered memory, impaired judgment, or cognitive dysfunction should be examined by a neurologist. A thorough neurological examination consisting of EEG, brain imaging, and lumbar puncture (if required) is necessary to decrease mortality and post-illness cognitive sequelae in patients on hemodialysis.

ACKNOWLEDGMENT

We would like to thank the personnel in the dialysis unit who, thanks to their dedication to the patient's care, detected signs that have been overlooked by many since March 2020, giving the patient a better chance to overcome his crippling condition.

CONFLICT OF INTEREST

The authors declare no conflict of interest regarding this article.

ETHICS STATEMENT

The procedures followed were in accord with the ethical standards of the committee on human experimentation of Brugmann University Hospital, Brussels, Belgium.

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