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Guillain-Barré syndrome associated with COVID-19 infection: A case report

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ABSTRACT

Coronavirus 2 or SARS-CoV-2 is predominantly manifests as a respiratory infection; however, it has been linked to a spectrum of neurological disorders such as vertigo, cephalalgia, cognitive impairment, myalgia, and anosmia. Emerging reports indicate several neurological illnesses that coincide with COVID-19, such as encephalitis and, notably, stroke. In this report, We present an instance of a patient infected with COVID-19 with Guillain-Barré Syndrome in this case report. Guillain-Barre Syndrome (GBS) is an inflammatory polyradiculoneuropathy linked to various viral infections. We present the case of a 76-year-old female patient hospitalized with acute progressive symmetric ascending quadriparesis. Seven days before hospitalization, the patient experienced fever and cough with RT-PCR testing confirmed a positive COVID-19 infection. Cerebrospinal fluid analysis revealed dissociation of cytoalbumin. Coronavirus stimulates inflammatory cells and produces various cytokines, leading to immune-mediated processes. GBS represents an immune-mediated disorder, with its pathogenesis intricately influenced by the pivotal role of molecular mimicry in its onset. Plasmapheresis was performed, resulting in an improved clinical outcome for the patient.

Keywords: Guillain-Barré syndrome, COVID-19, Plasmapharesis, Neurology, Coronavirus, Intensive Care

INTRODUCTION

COVID-19 is an infection by new beta coronavirus, which invade the cell via a fusion process with angiotensin-converting enzyme 2 (ACE-2) receptor [1]. Coronaviruses have the capacity to induce a variety of systemic infections, with respiratory manifestations being the most identifiable symptoms, akin to those observed in severe acute respiratory syndrome coronavirus (SARS-CoV) [2]. Mao et al. conducted an assessment of neurological symptoms in 214 patients diagnosed with COVID-19. Of Among the 214 hospitalized patients, 36.4% patients had neurological system manifestations including ischemic and hemorrhage stroke, headache, dizziness, hypogeusia, hyposmia, and muscle weakness (paralysis) [3]. In this report, we delineate the clinical manifestation of Guillain-Barré syndrome (GBS) in an individual diagnosed with COVID-19. GBS comprises a spectrum of neuropathic disorders typified by the progressive onset of muscular weakness and a concomitant decline in reflex activity [4,5]. The diagnostic criteria for Guillain-Barré Syndrome (GBS) include the progression of relatively symmetrical weakness accompanied by diminished or absent myotatic reflexes. It is essential that symptoms achieve their maximum intensity within a four-week timeframe from onset, and other potential causes must be meticulously excluded [4,5]. The mechanism of GBS is hypothesized to involve an inflammatory neuropathy resulting from cross-reactivity between neural antibodies and antigens, triggered by specific infections [6,7].

CASE PRESENTATION

A 76-years-old female, came to our emergency department with shortness of breath, fever, and cough for one-week, and had a contact with confirmed COV-

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ID-19. She had a past medical history of hypertension, tuberculosis, and type 2 diabetes mellitus. Physical examination showed respiratory rate 32×/minute and oxygen saturation of 91% on room air with abnormal respiratory sign. On laboratory test RT-PCR from nasopharyngeal specimen tested positive. All laboratory from patient at Day-1 presented in Table 1.

TABLE 1. Laboratory (Emergency Department) Day-1 admitted

Parameter	Result
RT-PCR	Positive
Hemoglobin	13.7 g/dL
Hematocrit	38.6 %
Erythrocyte	5.05 10^6/µL
MCV/ VER	76.4 fL
MCH/ HER	27.1 pg
MCHC/ KHER	35.5 g/dL
Trombocyt	170 10^3 /µL
Leukocyte	15.55 10^3 /µL
Basophil	0.3 %
Eosinophil	1.5 %
Neutrophil	71.9 %
Lymphocytes	10.9 %
Monocytes	15.4 %
d-Dimer	2560.47 ng/mL
Glucose	156 mg/dL
SGOT	21 U/L
SGPT	14 U/L
Creatinin	0.94 mg/dL
Ureum	32 mg/dL
pH	7.411
P CO_2	29.10 mmHg
P O_2	183.50 mmHg
O_2 Saturation	99.90 %
Base Excess	-4.00 mmol/L
Standard Base Excess	-6.2
Standard HCO_3	21.1 mmol/L
HCO_3	18.60 mmol/L
Total CO_2	19.50 mmol/L
Sodium	136 mEq/L
Potassium	4.65 mEq/L
Chloride	102.3 mEq/L
CRP- Quantitative	216.5 mg/L

Radiology of chest showed pneumonia. She admitted in isolated room and had received Remdesivir for 5 days. 4 days after, she transferred to intensive room. 17 days after, we found lower extremity weakness of 1 days before and felt ache in both her legs. The aches were progressive and reaches at nadir for 11 days before the weakness. There is no bowel and bladder dysfunction. On neurologic examination, she was conscious, alert, and oriented without sign abnormality in speech. The evaluation of cranial nerves yielded unremarkable findings. Motor examination showed normal tone and muscle strength with Medical Research Council Scale (MRC) of grade 5/5 in upper limbs. Muscle strength examination weakness in lower limbs with MRC scale of grade 3/5 hip flexion, 3/5 knee flexion, 5/5 dorsiflexion, and 5/5 plantar flexion. Physiologic reflexes in lower extremities were negative, normal muscle tone, bilateral anterior-tibial hypotrophy, and muscle tenderness were minimal. There was no vertebra tenderness. Non-contrast computed tomography of the brain showed multiple infarcts lead to chronic, cerebral small vessel disease, and brain atrophy (Figure 1).

Twenty-days after admitted, lower limbs weakness and aches still presented. On neurologic examination, muscle strength examination weakness in lower limbs with MRCS of grade 3/5 hip flexion, 2/5

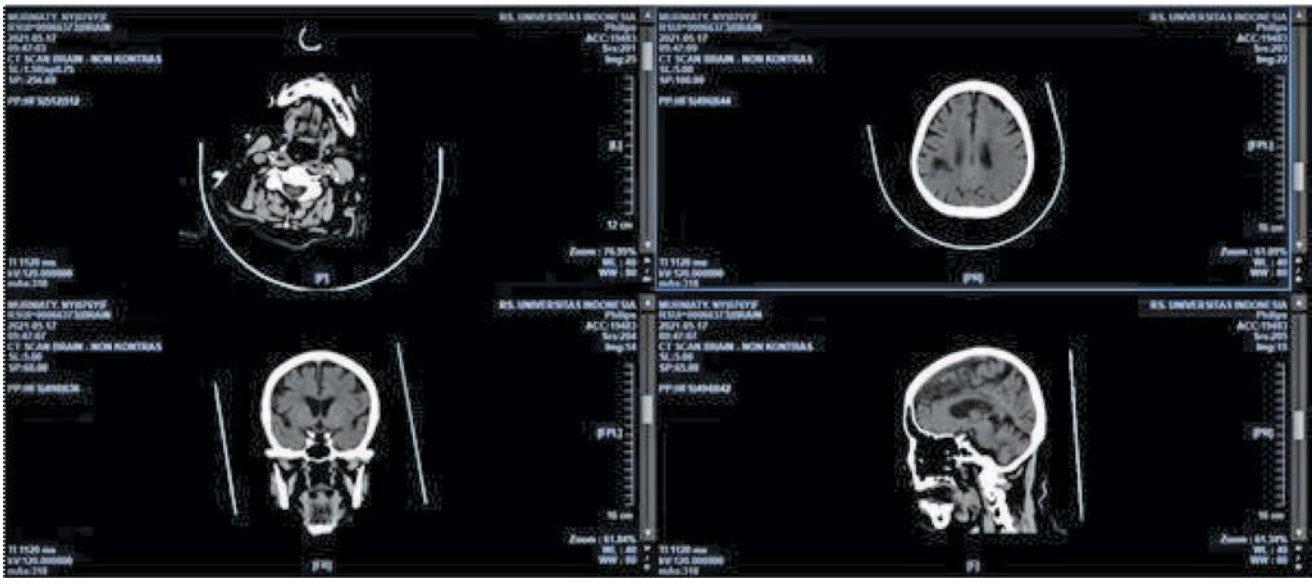

FIGURE 1. Brain CT-Scan

knee flexion, 5/5 dorsiflexion, and 5/5 plantar flexion. We had decided to lumbar puncture as planning diagnostic. Three-days after lumbar puncture, the result was cerebrospinal fluid (CSF) protein 46 mg/dL, CSF glucose 104 mg/ dL, PMN (segment) 0% /mcL, MN (limfosit) 1%/ mcL. This lumbar puncture analysis showed cytoalbumin dissociation. From clinical manifestations, physical examination revealed LMN paraparesis, CSF analysis showed cytoalbumin dissociation, she was diagnosed with Guillain-Barré Syndrome. Her Erasmus GBS Outcome Scores (EGOS) was 6, which on score 2 in age at onset, score 0 in preceding diarrhea, score 4 in MRC-sum score. She received therapy using plasmapheresis with regiment of three times a week. Plasmapheresis was performed with Blood Flow 90ml/ minute, Replacement volume 3000 ml, PBP 0, Plasma loss 0, heparin 2500 IU in 50 ml NaCl 0.9%/ with rate 2 mL/jam. After three times plasmapheresis had implemented, she had marked improvement of her neurological symptoms and the laboratory markers. All laboratory from patient at Day-17 presented in Table 2.

TABLE 2. Laboratory (Intensive Room) Day-17 admitted

Parameter	Result
Hemoglobin	12.6 g/dL
Hematocrit	35.9 %
Erythrocyte	4.66 10^6/µL
MCV/ VER	77.0 fL
MCH/ HER	27.0 pg
MCHC/ KHER	35.1 g/dL
Trombocyt	152 10^3 /µL
Leukocyte	16.93 10^3 /µL
Basophil	0.1 %
Eosinophil	0.1 %
Neutrophil	89.8 %
Lymphocytes	5.1 %
Monocytes	4.9 %
d-Dimer	338.05 ng/mL
Glucose	232 mg/dL
SGOT	41 U/L
SGPT	145 U/L
Creatinin	0.71 mg/dL
Ureum	88 mg/dL
pH	7.453
P CO_2	40.30 mmHg
P O_2	87.80 mmHg
O_2 Saturation	97.50 %
Base Excess	4.8 mmol/L
Standard Base Excess	4.3
Standard HCO_3	28.7 mmol/L
HCO_3	28.50 mmol/L
Total CO_2	29.70 mmol/L
Sodium	134 mEq/L
Potassium	4.23 mEq/L
Chloride	99.7 mEq/L
Procalcitonin	<0.20 ng/mL
CRP- Quantitative	<2.5 mg/L

DISSCUSION

SARS-CoV-2, a novel coronavirus, was initially identified in Wuhan, China, in December 2019 and is the cause of COVID-19. In general, the symptoms that has presented are fever, cough, and difficulty breathing. SARS-CoV-2 primarily targets the respiratory system through the process of fusion with angiotensin-converting enzyme 2 (ACE2) receptor [7,8]. Nevertheless, neurological involvement in SARS-CoV-2 infection is uncommon and can worsen the prognostic clinical outcome [9]. Mao et al. reported 36.4% severe COVID-19 infection had neurological manifestations, such as acute impaired consciousness 14.8%, acute cerebrovascular diseases 5.7%, and skeletal muscle injury, including GBS, 19.3% [3]. It may manifest during the acute phase through direct viral-induced cytopathic effects, probably though afferent branches of the trigeminal and olfactory nerve, para-infectious via cytokine release (cytokine storm), occurring in a post-infectious phase through an immune-mediated phenomenon, typically presents in a classical manifestation as GBS [7,9,10].

GBS is an acute, immune-mediated polyneuropathy that is commonly preceded with infection. Several infectious microorganisms have been associated with GBS, including Epstein-Barr, Cytomegalovirus, Campylobacter jejuni, Zika virus, and it has also been documented in cases of severe acute respiratory syndrome caused by coronavirus infection [7,9,11]. In this case, the patient developed with classic manifestations of GBS, LMN type weakness, 17 days after RT-PCR Positive. Zuberbühler et al. reported COVID-19 with common symptoms, cough, and fever, mean duration from the onset of COVID-19 symptoms to the emergence of neurological manifestations was 12.1 days [12]. Thus in our case, considering the history of infection, relative symmetrical limb weakness with monophasic course, we suspected GBS as the diagnosis. The finding of protein-cell dissociation in CSF 6 days after neurological manifestation, confirms this disorder. COVID-19 stimulates inflammatory cells, especially cytokines, which then form immune-mediated processes. Until now, there has research that explains how COVID-19 induces the formation of antibodies that trigger COVID-19 yet [9,11,12].

As of March 2021, 48 cases of GBS in association with SARS-CoV-2 infection have been reported in literature. Toscano et al. Reported 5 patients form Italy; two of them had a history of diabetes mellitus (DM),

like the patient we reported [8]. It is recognized that the presence of underlying diabetes mellitus can exacerbate both the electrophysiological and clinical characteristics of concurrent peripheral neuropathies, such as GBS. The mechanism underlying the DM-induced GBS remains unclear. However, it could be associated with chronic inflammatory conditions linked to diabetes mellitus, coupled with neurovascular compromise of peripheral nerves [7,9,11]. Given that, the common symptoms of COVID-19 have been identified as respiratory infections. And two-thirds of GBS patients usually have a previous respiratory infection, GBS should be considered as one of complications of COVID-19 [13].

Our patient received therapy using plasmapheresis with regiment of three times a week. Plasmapheresis was performed with Blood Flow 90ml/ minute, Replacement volume 3000 ml, PBP 0, Plasma loss 0, heparin 2500 IU in 50 ml NaCl 0.9%/ with rate 2 mL/jam. After three times plasmapheresis had implemented, she had marked improvement of her neurological symptoms. Plasma exchange therapy to remove immune complexes circulating through the plasma demonstrated recovery time and the ability to walk again, meet ventilatory requirements and duration, and enhanced muscular strength after a one-year duration is observed in comparison to a placebo [14,15]. According to the guidelines plasma exchange therapy is effective and should be used for severe Acute Inflammatory Demeylinating Polyradiculoneuropathy (AIDP), and may be effective and should be considered in mild cases of Acute Inflammatory Demeylinating Polyradiculoneuropathy (AIDP) [16]. The optimal response is attained when plasmapheresis is conducted within seven days of the onset of symptoms; however, there is a beneficial effect for up to 30 days after the onset of symptoms [14-16]. Several studies suggests that patients with mild GBS benefit from two plasma exchange sessions, whereas patients with advanced to severe disease require four sessions of plasmapheresis [17]. From our case, plasmapheresis therapy should be initiated concurrently with antiviral treatment [7]. Additionally, it is noteworthy that the combination of plasmapheresis and antiviral treatment may yield better results in the context of COVID-19.

CONCLUSION

In summary, we presented a case of GBS) in a patient diagnosed with COVID-19. GBS should be considered among the neurological complications of COVID-19 infection. The inflammatory response triggered by COVID-19, stimulating inflammatory cells and producing various inflammatory cytokines, leads to immune-mediated processes. Plasmapheresis therapy was administered, resulting in a notable improvement in the patient's clinical outcome. The positive response may be attributed to the timely initiation of plasmapheresis, emphasizing its potential as a therapeutic approach for GBS in the context of COVID-19.

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