

Guillain-Barré Syndrome as a Neurological Complication of Novel COVID-19 Infection

A Case Report and Review of the Literature

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Introduction: The novel coronavirus (COVID-19) is a global pandemic. Although the main clinical manifestation of COVID-19 is respiratory involvement, there is evidence suggesting the neuroinvasive potential of COVID-19. There are limited reports of neurological complications of COVID-19 infection in the literature. Herein, we aim to describe 2 members of a family affected by COVID-19, presenting with ascending paresthesia with the final diagnosis of Guillain-Barré syndrome.

Case Report: A 38-year-old man presented with a history of ascending paresthesia and bilateral facial droop since 5 days before admission. The medical history was positive for flu-like symptoms affecting all the members of his family. The neurological examination was notable for bilateral peripheral facial paralysis, generalized areflexia, and decreased sensation in distal limbs. The cerebrospinal fluid analysis revealed an albuminocytologic dissociation. In addition, the electromyography-nerve conduction study findings were suggestive of acute axonal demyelinating polyneuropathy. Meanwhile the patient was treated with a diagnosis of Guillain-Barré syndrome, his 14-year-old daughter presented with a history of progressive paresthesia and weakness. Similar to her father, the paraclinical evaluations were consistent with Guillain-Barré syndrome. Taking into account clinical findings and the outbreak of COVID-19, the suspicion of COVID-19 was proposed. Eventually, on the basis of throat swab samples stand on polymerase chain reaction, the patients were diagnosed with COVID-19.

Conclusion: Our cases revealed the familial occurrence of Guillain-Barré syndrome after COVID-19 infection. The authors emphasize neurological complications of COVID-19.

Key Words: novel coronavirus, COVID-19, neurological complication, Guillain-Barré syndrome, GBS

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The novel coronavirus (COVID-19) was first reported in December 2019 in Wuhan, China with a cluster of unexplained pneumonia which soon turned into a global health concern. It has been recently declared as a global pandemic by the World Health Organization affecting > 862,495 cases worldwide.¹

Similar to other coronaviruses, COVID-19 mainly affects the respiratory tract. After an incubation period of 3 to 14 days, nonspecific symptoms such as malaise, fever, and dry cough will appear. Depending on the patient's immunity system level

and concurrent comorbidities, the symptoms may remain mild or lead to severe progression and even death.^{2–4}

Based on recently published studies, there is evidence suggesting the neuroinvasive potential of COVID-19.⁵ However, there are limited reports of neurological complications of COVID-19 in the literature. Mao et al reviewed the neurological manifestations of 214 patients with COVID-19. Their findings revealed that headache and hyposmia were the main central and peripheral nervous system involvement, respectively.⁶

Herein, we aim to report 2 cases of COVID-19 in a family presenting with acute ascending paresthesia with the final diagnosis of Guillain-Barré syndrome (GBS).

CASE PRESENTATION

The patient was a 38-year-old healthy man presenting with a 5-day history of symmetric progressive ascending paresthesia after an upper respiratory infection. The neurological manifestations began with acute progressive paresthesia of distal lower extremities evolving to the upper limbs leading to quadriparesthesia. He subsequently developed bilateral facial droop leading to drooling of saliva and slurred speech. He denied any facial numbness, swallowing inability, and blurred vision. In addition, he declared a new transient generalized band-like headache and mild dizziness.

The medical history was unremarkable except for hypertension. Moreover, he had a history of upper respiratory tract infection 3 weeks before admission affecting all the 4 members of his family that subsided over 2 weeks without considerable medical care except for pain killers.

On examination, the patient was alert and conscious. His vital signs revealed body temperature 36.5°C, blood pressure 175/85 mm Hg, respiratory rate of 16 bpm, pulse rate 75 beats/min, and oxygen saturation of 99%. The systemic examination was normal. The neurological examination was notable for bilateral complete lower motor neuron type facial paralysis and mildly dysarthric speech. Other cranial nerves were intact. The motor examination revealed normal tone and force regarding the Medical Research Council score. Deep tendon reflexes were generally absent. Sensory examination indicated a decrease in all sensation modalities in 4 limbs affecting the distal parts up to ankle and elbow joints. The patient was ambulatory and no limb ataxia was observed. However, the Romberg test was positive when the patient closed his eyes. The remainder of the examination was unremarkable.

All conventional diagnostic tests were essentially normal including electrocardiogram, routine blood chemistry, C-reactive protein, erythrocyte sedimentation rate, and chest and brain computed tomography.

With suspicion of acute demyelinating polyneuropathy, the patient was transferred to the intensive care unit (ICU). The cerebrospinal fluid (CSF) picture revealed normal glucose and cell count and 139 mg/dL protein. CSF viral serology and gram stain and culture were negative. On the second day of admission, nerve conduction study (Tables 1, 2) was performed that yielded considerable reduction in the compound motor action potentials amplitude with prolonged distal latency and reduced conduction velocity of tibial nerves in a range of demyelinating process and absent peroneal, and median and ulnar nerves' compound motor action potentials. The ulnar and median Sensory nerve action potential were absent. However, the sural nerve

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Informed consent was obtained by the patient for publication.

The authors declare no conflict of interest.

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TABLE 1. Motor Nerve Conduction Study

Nerve	Latency (ms)		Amplitude (micro V)		Conduction Velocity (m/s)		F Wave	H Wave
	Right	Left	Right	Left	Right	Left	Right	Left
Median	Absent	Absent	Absent	Absent	Absent	Absent	Absent	—
Ulnar	Absent	Absent	Absent	Absent	Absent	Absent	Absent	—
Tibial								
Ankle	9.5	9.9	0.5	0.4	24	23	Absent	Absent
Popliteal fossa	27.7	28.1	0.0	0.0				
Peroneal	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

was spare. In addition, F and H waves were absent. Electromyography showed reduced recruitment in all limbs without evidence of spontaneous activity. The findings were consistent with acute axonal-demyelinating polyradiculoneuropathy.

On hospital day 3, the illness evolved with autonomic features as the patient developed tachycardia and blood pressure instability. In addition, the patient developed bulbar involvement in a way he was unable to swallow, accompanied by severely slurred speech. The re-examination was notable for the bilaterally reduced gag reflex.

Subsequently, treatment started with therapeutic plasma exchange (TPE). We did a total of 5 sessions of TPE (alternate days). One standard TPE session was 2.5 plasma volume exchange using 5% albumin as a replacement fluid. Furthermore, labetalol by intravenous bolus was administered to control the sympathetic nervous system over-reactivity, which was successfully controlled over 24 hours.

Meanwhile, his 14-year-old daughter presented with a history of progressive ascending quadriparesis since 2 days before admission, which was accompanied by mild lower limb weakness. Similar to her father, she complained of headaches and dizziness. The neurological examination was within normal in cranial nerves. The motor system assessment revealed the power muscle grade 4/5 in lower limbs, affecting both the distal and proximal muscles and 5/5 in upper limbs. The deep tendon reflexes were hypoactive in upper limbs and absent in lower limbs, respectively. The sensory examination was notable for a decreased light touch, position, and vibration sensation in all distal limbs up to ankle and elbow joints. The patient was ambulatory, however, she became ataxic with closed eyes.

Again, all the ancillary examinations were within normal limits except for the albuminocytologic dissociation in the CSF. It should be noted that the electromyography-nerve conduction study has not yet carried out for the patient. In the following, the patient was hospitalized in ICU and intravenous immunoglobulin (20 g intravenously daily for 5 d) was instituted.

Taking all considerations into account—familial aggregation, history of upper respiratory infection in all family members, familial presentation of GBS, and an outbreak of novel coronavirus pneumonia—COVID-19 was suspected. The polymerase chain reaction assay of throat swab sample was positive for COVID-19 in both patients.

As a final point, according to the epidemiologic characteristics, clinical features, and paraclinical findings, the diagnosis of GBS in association with COVID-19 was made.

The treatment started with oral hydroxychloroquine sulfate 200 mg two times per day for a week. The therapeutic course has been fulfilled in ICU. No more hemodynamic instability occurred. Neurological symptoms gradually improved. Eventually, they transferred to the neurology ward and discharged with a good general condition. The

neurological examination of the girl was notable for generalized hyporeflexia and decreased light touch sensation in distal limbs. Her father revealed the same examination with mild bilateral facial paresis.

DISCUSSION

Coronaviruses are enveloped nonsegmented positive-stranded RNA viruses belonging to the family Coronaviridae that are mainly attached to the cellular receptor angiotensin-converting enzyme 2 (ACE2) receptors located in the nasal epithelium and lower respiratory airways leading to respiratory symptoms. Nevertheless, under poorly understood conditions, it could also invade the nervous system.^{4,7,8} There are limited reports of neurological complications of COVID-19 in the literature. The study of Wei et al⁸ reported a case of COVID-19 with a primary manifestation being third nerve palsy. The study of Filatov and colleagues⁹ reported a case of COVID-19 presenting with acute encephalopathy who was first diagnosed with chronic obstructive pulmonary disease exacerbation. However, regarding the unexplained encephalopathy and outbreak of the novel emerging virus, the suspicion of COVID-19 was proposed, which was eventually confirmed by polymerase chain reaction assay. More recently, a report of acute necrotizing encephalopathy associated with COVID-19 has been published. The patient was an elderly woman with COVID-19 who went under brain imaging because of considerable loss of consciousness. The brain magnetic resonance imaging demonstrated hemorrhagic rim enhancing lesions within the bilateral thalami, medial temporal lobes, and subinsular regions which was compatible with acute necrotizing encephalopathy.¹⁰

On the other hand, it should be noted that GBS is a rare acute immune-mediated polyradiculoneuropathy with an incidence rate of 0.6 to 4 cases per 100,000 annually. The exact etiology of GBS is unknown. However, in ~50% of the cases, a specific type of preceding infection could be identified in which C-Jeuni is of paramount importance.^{11,12} Furthermore, it is noteworthy that the familial occurrence of GBS is a rare event and only a few articles have been published so far.¹³

In the cases we described, the neurological complication was confined to the peripheral nervous system that has not been reported so far. The occurrence of polyneuropathy could be explained by the aberrant autoimmune response targeting the peripheral nerves regarding the microbial and host factors.¹⁴ However, our patients were unique in that both of them belonged to the family with the same antecedent history of flu-like symptoms before the presentation.

The present report indicates the diverse neurological manifestations of COVID-19 that highlights the importance of neurological assessment in patients with COVID-19.

CONCLUSIONS

COVID-19 infection is considered as a global pandemic because of the high potential of transmissibility. There is

TABLE 2. Sensory Nerve Conduction Study

Nerve	Latency (ms)		Amplitude (micro V)		Conduction Velocity (m/s)	
	Right	Left	Right	Left	Right	Left
Median	Absent	Absent	Absent	Absent	Absent	Absent
Ulnar	Absent	Absent	Absent	Absent	Absent	Absent
Sural	3.0	3.0	10	10	55	55

evidence suggesting the neuroinvasive potential of COVID-19. However, there is no report of COVID-19 association with GBS in the literature. Herein, we described 2 unique events: an occurrence of familial GBS after recovery phases of COVID-19 infection.

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