

# Guillain-Barré syndrome related to SARS-CoV-2 infection

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The outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) responsible for coronavirus disease 2019 (COVID-19) led to the death of thousands of people around the world.<sup>1</sup> Neurologic manifestations are not much specific apart from acute anosmia, and post-infectious manifestation data are missing.<sup>2</sup> We described the cases of 2 patients exhibiting demyelinating form of Guillain-Barré syndrome (GBS) and summarized neurologic manifestations and investigations results in table 1.

A 43-year-old man presented with cough, asthenia, and myalgia in legs, followed by acute anosmia and ageusia with diarrhea the next day. Symptoms resolved spontaneously after 2 weeks. Twenty-one days after the beginning of respiratory symptoms, he presented with in a rapidly progressive manner paraesthesia, hypoesthesia, and distal weakness in the lower limbs. In the following 2 days, these symptoms extended to the mid thigh and tip of the fingers associated with ataxia, and he was hospitalized at day 4 because a right peripheral facial palsy had occurred. His body temperature was 36.9°C and oxygen saturation was 99%. Neurologic examination disclosed decreased light touch from mid thigh to feet and the tip of the fingers; decreased vibration sense in the lower limbs, symmetric weakness for dorsiflexion and extension of the toes (Medical Research Council [MRC] score = 3/5) and flexion of the thigh (MRC = 4/5); and areflexia in the forelimbs apart from the left biceps reflex.

Laboratory results at day 4 were unremarkable (normal blood cell count, negative C-reactive protein, negatives HIV, Lyme, and syphilis serologies). Antigangliosides antibodies were negatives. Nasopharyngeal swab test was positive for SARS-CoV-2 on reverse transcription-polymerase chain reaction (RT-PCR) assay. CT of the chest showed ground-glass opacities in 10–25% on both lungs (figure e-1, [links.lww.com/NXI/A267](https://links.lww.com/NXI/A267)). CSF results showed normal cell count ( $1 \times 10^6/L$ ), increased protein level (0.94 g/L), and negative SARS-CoV-2 on RT-PCR assay. MRI at day 7 showed multiple cranial neuritis (in nerves III, V, VI, VII, and VIII), radiculitis, and plexitis on both the brachial and lumbar plexus (figure e-2, [links.lww.com/NXI/A267](https://links.lww.com/NXI/A267)). Nerve conduction studies at day 9 showed 2 conduction blocks (>50%) in both peroneal nerves, decreased motor conduction velocities in both peroneal and tibial nerves approximately 30–37 m/s, a sural sparing pattern, abolition of the H-reflex, and slightly increased of F-wave latencies supporting demyelinating pattern (table e-1, [links.lww.com/NXI/A267](https://links.lww.com/NXI/A267)). The patient was diagnosed with GBS, and IV immunoglobulin infusions (IVIg) were started at day 5 (2 g/kg). He was rapidly discharged home with progressive improvement.

An obese 70-year-old woman presented with anosmia and ageusia, followed by diarrhea for 2 days. She complained of mild asthenia and myalgia without fever. All symptoms resolved excepted anosmia and ageusia. Nasopharyngeal swab test was positive for SARS-CoV-2 on RT-PCR assay. Seven days later, she presented with acute proximal tetraparesis and distal forelimb and perioral

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**Table 1** Clinical characteristics and investigations result for 2 patients with GBS related to SARS-CoV-2 infection

| Patient                   | Days between the onset of COVID-19 and GBS | GBS symptoms and signs   | CSF findings   | Nerve conduction studies  | MRI results  | Treatments and evolution                           |
|---------------------------|--|--|--|---|--|--|
| <b>1. Man<br/>48 yo</b>   | 21 d                                       | Flaccid paraparesis, generalized areflexia, lower-limb and distal upper-limb paresthesia, ataxia; right facial palsy (day 4) | Day 4; protein level: 0.95 g/L; cell count: $1 \times 10^6/L$ ; negative SARS-CoV-2 RT-PCR   | Day 9; demyelinating pattern with motor decreased conduction velocities and conduction blocks               | Day 7; radiculitis and plexitis on both brachial and lumbar plexus; multiple cranial neuritis (in nerves III, VI, VII, and VIII) | Day 5; IVIg (2 g/kg); progressive improvement      |
| <b>2. Woman<br/>70 yo</b> | 10 d                                       | Flaccid tetraparesis, generalized areflexia, forelimb paresthesia; respiratory failure (day 3)                               | Day 3; protein level: 1.6 g/L; cell count: $6 \times 10^6/L$ ; negative SARS-CoV-2 on RT-PCR | Day 7; demyelinating pattern with motor and sensitive decreased conduction velocities and conduction blocks | Not performed  | Day 4; IVIg (2 g/kg); slow progressive improvement |

Abbreviations: COVID-19 = coronavirus disease 2019; GBS = Guillain-Barré syndrome; IVIg = IV immunoglobulin infusions; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

paraesthesia. She was hospitalized for dyspnea and loss of ambulation 3 days later and was rapidly transferred to an intensive care unit for noninvasive ventilation for acute respiratory failure with hypercapnia. She was discharged from the intensive care unit 9 days later, without requiring invasive mechanical ventilation. Neurologic examination disclosed proximal lower-limb weakness (MRC 2/5), distal weakness (MRC 4/5), and diffuse areflexia.

At admission, C-reactive protein was slightly increased at 22 mg/L. Antigangliosides antibodies were negative. CSF results showed subnormal cell count ( $6 \times 10^6/L$ ), increased protein level (1.06 g/L), and negative SARS-CoV-2 on RT-PCR assay. CT of the chest showed moderate ground-glass opacities in both lungs (figure e-1, [links.lww.com/NXI/A267](https://links.lww.com/NXI/A267)). Nerve conduction studies at day 7 showed a typical demyelinating pattern with a conduction block in the left median nerve, temporal dispersion, upper limb increased motor distal latencies, diffuse decreased motor and sensory conduction velocities lower than 38 m/s in 9 nerves of 10 tested (table e-1, [links.lww.com/NXI/A267](https://links.lww.com/NXI/A267)), and neurogenic pattern on EMG. IVIg (2 g/kg) were started at day 4 after the onset of the first neurologic symptoms. Left peripheral facial palsy occurred in a delayed manner at day 9. Her clinical condition improved slowly with physiotherapy, needing a transfer in a rehabilitation center.

We reported here 2 cases of GBS related to SARS-CoV-2 infection with neurologic improvement on IVIg, adding to few cases of GBS, one case of Miller Fisher syndrome, and one case of polyneuritis cranialis already published.

The first case report described a patient with GBS whose symptoms began 7 days before COVID-19, which asks the question of parainfectious profile or coincidence.<sup>3</sup> However, previous reports and our cases suggest that GBS associated with SARS-CoV-2 infection could start between 5 and 21 days after the SARS-CoV-2 clinical symptoms.<sup>4</sup> It could follow a postinfectious profile as reported on Middle East respiratory

syndrome coronavirus infection in 4 patients with Bickerstaff's encephalitis overlapping with GBS.<sup>5</sup>

Thus, our cases add to several other reported cases and strengthen the view that GBS occurs with COVID-19.

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### Disclosure

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## References

1. Guan W, Ni Z, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020;382:1708–1720.
2. Mao L, Jin H, Wang M, et al. Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. *JAMA Neurol* Epub 2020 April 10. doi: 10.1001/jamaneurol.2020.1127.
3. Zhao H, Shen D, Zhou H, et al. Guillain-Barré syndrome associated with SARS-CoV-2 infection: causality or coincidence? *Lancet Neurol* 2020;19:383–384.
4. Toscano G, Palmerini F, Ravaglia S, et al. Guillain-Barré syndrome associated with SARS-CoV-2. *N Engl J Med* Epub 2020 Apr 17. doi: 10.1056/NEJMc2009191.
5. Kim JE, Heo JH, Kim HO, et al. Neurological complications during treatment of Middle East respiratory syndrome. *J Clin Neurol* 2017;13:227–233.