

Guillain-Barré Syndrome in a COVID-19 Patient: A Case Report and Review of Management Strategies

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Abstract Guillain-Barré syndrome (GBS) is an immune mediated disease that affects peripheral nerves with possible life-threatening complications. GBS has multiple subtypes including acute inflammatory demyelinating polyradiculoneuropathy (AIDP), acute motor axonal neuropathy (AMAN) and acute motor sensory axonal neuropathy (AMSAN), which can make GBS difficult to diagnose. GBS commonly presents after viral infections such as influenza virus, campylobacter jejuni, and zika virus. GBS commonly presents with a prolonged clinical course leading to increased morbidity among affected patients. It is not surprising that COVID-19 has been connected with multiple cases of GBS, which may alter the recovery course for several patients post-COVID. In this report, we present a case of 69-year-old-female who presented with progressive motor weakness and loss of sensation in her extremities after testing positive for antibodies to COVID-19 one-month prior to presentation. Her presentation and treatment of GBS in the setting of COVID-19 is an example of one of the many COVID-19 complications and sheds light on the prolonged recovery course that we may experience as clinicians in the wake of this pandemic.

Keywords: COVID-19, Guillain-Barré syndrome, SARS-CoV2

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1. Introduction

Coronavirus disease 19 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. Cases were first reported in Wuhan, Hubei Province, China in December 2019 and were soon followed by a rapid spread across international borders [2]. COVID-19 was declared a global pandemic by the World Health Organization in March 2020 [3]. While SARS-CoV2 has been observed to cause a respiratory illness in many cases, neurological complications of the virus have been increasingly reported, especially in those patients with more severe infection. These include Bell's palsy, seizures, meningoencephalitis, cerebrovascular accidents, acute flaccid myelitis, and Guillain-Barré syndrome (GBS) and its variants [4,5,6]. GBS is a rare autoantibody-mediated, neuromuscular disorder classically characterized by an acute, ascending paralysis after a recent bacterial or viral infection. A viral pandemic is often linked to a rise in cases of GBS as seen with recent outbreaks of zika virus and Middle East respiratory syndrome virus (MERS-CoV) [7,8,9]. Here we present an atypical case of GBS secondary to COVID-19 infection.

2. Case Presentation

A 69-year-old female presented with progressive motor weakness and loss of sensation in her extremities over five days. On the first day she had numbness and tingling in her right hand and soon felt similar symptoms in her right leg. The next day she had numbness and tingling in her left hand radiating to her left shoulder and then developed weakness in the arm. She visited the emergency department on the third day out of concern for her symptoms. On exam, she had proximal weakness in the left upper and lower extremities (4/5) and left-sided numbness to the midarm and midleg. CT scan of the head did not show acute intracranial pathology. Differential diagnosis included recrudescence of stroke, inflammatory myopathy (less likely given asymmetric pattern), and Guillain-Barre Syndrome (less likely given descending pattern). She was instructed to follow up in neurology clinic, obtain an MRI of the head, neck, and spine as an outpatient, and discharged given her non-progressive symptoms, hemodynamic stability, and independent ambulation. Two days later she returned to the emergency department complaining of worsening numbness and weakness in all four extremities. She had fallen that day

when her legs gave out; she fell on her back and struck her head without loss of consciousness. Notably, the patient reported that her husband had a COVID-19 infection seven months prior and that she recalls having an upper respiratory illness with cough at the time; she tested positive for antibodies to SARS-COV2 one month prior to presentation. She denied fevers, headaches, neck or back pain, dizziness, dyspnea, dysphagia, abdominal pain, emesis or diarrhea, urinary or fecal incontinence, or saddle anesthesia.

Past medical history included hypertension, hyperlipidemia, sickle cell trait, iron deficiency anemia, and a stroke thirty years prior with residual left-sided weakness (that resolved with physical therapy). Family history was non-contributory. No known allergies. Her home medications included nifedipine, losartan, metoprolol succinate, spironolactone, and atorvastatin. She denied use of tobacco, alcohol, or recreational substances.

Vital signs were as follows: temperature 98 F, blood pressure 152/82 mmHg, heart rate 89 BPM, oxygen saturation 100 percent on room air. On exam, patient was in no acute distress, alert and oriented, and well-appearing. Cardiopulmonary exam without abnormality. No meningeal signs, neck strength on flexion and extension 5/5. No midline or paraspinal tenderness. Pupils equal round and reactive to light and accommodation and extraocular movements intact. No ptosis, mild left lower facial droop, hearing intact to finger rub bilaterally, tongue midline, no dysarthria, sternocleidomastoid strength 5/5. Tone and bulk were normal. Strength in bilateral upper extremities was as follows: shoulder abduction 3/5, elbow flexion 2/5, elbow extension 4-/5. Strength in bilateral lower extremities was as follows: hip flexion 2/5, knee flexion 3/5, knee extension 3/5, dorsiflexion 3/5, plantar flexion 5/5. Length-dependent loss of sensation to pinprick to the midarm and mid-shin bilaterally. Reflexes 1+ in upper extremities, right patellar 1+, left patellar 0, absent ankle jerk, and Babinski reflexes mute.

Labs were significant for CPK 190, ESR 50, and hemoglobin A1C 5.8. Complete blood count, comprehensive metabolic panel, thyroid function, vitamin B12, zinc, copper, serum protein electrophoresis, ceruloplasmin, CRP, ACE, and complement levels were all within normal limits. HIV, ANCA, cryoglobulins, syphilis IgG, rheumatoid factor, hepatitis A IgM, hepatitis B surface antigen, hepatitis C antibody were all negative. EKG with normal sinus rhythm and normal QTc interval. MRI of the head showed chronic microvascular ischemic changes. MRI of the spine revealed abnormal enhancement in the cauda equina suspicious for acute inflammatory demyelinating polyneuropathy (AIDP).

The patient was admitted to the neurology service for management of Guillain-Barre syndrome secondary to previous COVID-19 infection. She was transferred to the medical intensive care unit for closer monitoring of neurological, respiratory, and autonomic function (blood pressure, heart rate, temperature). A lumbar puncture was not performed in the setting of deteriorating respiratory function and, on the third day of admission, as her numbness advanced and affected her face, she was unable to fully phonate, and given deteriorating respiratory status, patient was intubated to protect her airway and placed on mechanical ventilation. Repeat SARS-COV-2 antibodies

were again positive in high titers. Electromyography was performed and revealed diffusely absent F responses in Left median, left peroneal, left tibial and left ulnar motor nerves as well as diffusely absent sensory nerve action potentials. The study was consistent with an acute inflammatory demyelinating sensorimotor neuropathy as seen in AIDP. Blood pressure medications were all stopped in the setting of highly labile measurements. She was given intravenous immunoglobulin (IVIG) 2 gm/kg divided over a five-day course. The patient's strength slowly improved over the next few days, however she failed extubation twice. Subsequently, a tracheostomy was placed, and she weaned to trach collar. Her muscular strength improved, and patient was discharged to sub-acute rehabilitation center.

3. Discussion

GBS is an antibody-mediated disease of the peripheral nerves that can be potentially life-threatening. The difficulty in diagnosing GBS lies in the heterogeneity of the disease, specifically variants in presentation and timing of symptom onset. To date, there are subtypes of GBS that have been identified including acute inflammatory demyelinating polyradiculoneuropathy (AIDP), acute motor axonal neuropathy (AMAN) and acute motor sensory axonal neuropathy (AMSAN) [10]. Disease progression can be rapid with several patients developing respiratory collapse requiring mechanical ventilation [11]. After treatment and stabilization, patients may require weeks to months in a so-called "plateau" phase before any significant improvement is achieved and typically symptoms can last up to six months before patients return to their baseline [12,13].

Treatment is offered to GBS patients with IVIG or plasma exchange. Typically, treatment is reserved for patients who cannot ambulate independently, have progressive symptoms, bulbar weakness, and those with respiratory compromise. Treatment with IVIG is best if offered within two weeks of symptoms onset, and for plasma exchange is best if offered within 4 weeks of symptom onset. Whether or not there is benefit beyond these time-periods is unknown as there is little research to show this [13,14]. Treatment with IVIG and plasma exchange have been shown to have similar efficacy in treatment of GBS [15]. Although efficacy is similar the simplicity of administering IVIG over coordinating plasma exchange has made it a more popular choice, as was chosen in our patient.

Several case reports have depicted GBS in the setting of COVID-19. Additionally, a meta-analysis summarized 42 cases of GBS from January to August of 2020 and 14 of these patients had respiratory failure of which 12 needed mechanical ventilation [16]. Another meta-analysis showed that 61 cases, with some overlap, of GBS in the setting of COVID-19 and 23 of these patients required intensive care unit (ICU) admission, with 17 needed mechanical ventilation [17]. The number of cases reported in the setting of the COVID-19 pandemic is significant, especially when considering the number of patients that needed mechanical ventilation and ICU stays in the post-infectious period.

The mechanism by which SARS-COV-2 causes GBS is not completely understood, however it is thought that the principal target for SARS-COV-2 virus is angiotensin-converting Enzyme 2 (ACE-2) receptor, which is found in the respiratory tract, brain, and neurons [18,19]. Ongoing research shows that SARS-CoV-2 activates leukocytes releasing a high-level of cytokines, which further activates the inflammatory cascade and causes extensive tissue damage with multiple organ dysfunction. This pathway is thought to be one of the major causes for end organ damage, including neurologic dysfunction in the pathogenesis of COVID-19 [20].

Ongoing research will help clarify the exact mechanisms by which SARS-CoV-2 causes infection and causes the pronounced neurologic side effects that have been highlighted already. This case highlights not only a complication of COVID-19, which may not have been expected, but also brings GBS to the forefront in terms of differential diagnosis for patients with unexplained weakness in the setting of recent COVID-19 infection. Given the heterogeneity of the disease, difficulty in diagnosing, and acutely ill nature of many presenting patients, time to diagnosis is often prolonged, however these cases will hopefully prove to rectify that.

4. Conclusion

Exponential numbers of GBS cases have been reported during the COVID-19 pandemic suggesting a pathophysiologic link between COVID-19 and GBS. We hope this case along with several others will aide in further research in understanding, why some patients experience this negative outcome and other do not. Additionally, we hope to highlight the increasing number of cases of GBS to bring attention to this potential complication in the wake of the COVID-19 pandemic.

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