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Post COVID-19 Guillain-Barré-Syndrome (GBS)

A case report from Oman

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Abstract

Guillain-Barré-Syndrome (GBS) is one of the reported neurological manifestations linked to a severe acute respiratory syndrome caused by coronavirus 2 (SARS-CoV-2)(COVID-19). We are presenting a case of a 72-years-old male patient who attended Sultan Qaboos University Hospital with a history of progressive bilateral limbs weakness and numbness. After exclusion of other possible causes, a diagnosis of GBS induced by COVID-19 was made. He received Intravenous Immunoglobulin (IVIG) 0.4g/kg/day for 5 days. This diagnosis is in line with a rare complication of COVID-19. This case highlights the characteristics and the course of GBS following COVID-19 infection. Further studies are needed to characterize the manifestations and the course of various neuromuscular disorders in relation to COVID-19 infection.

Keywords: COVID-19, Guillain-Barré-Syndrome (GBS), IVIG, Oman

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)(COVID-19) was announced as a pandemic in March 2020 by the world health organization (WHO).[1] Since then, neurological

manifestations and complications of COVID-19 are reported.[2] Chinese and Spanish studies reported the prevalence of neurological manifestations in admitted patients with COVID-19 as 36.4% and 57.4%, respectively. [3,4]

Guillain-Barré-Syndrome (GBS) is known as an immune-mediated inflammatory polyradiculoneuropathy with acute ascending symmetrical weakness along with areflexia.[1,4,5] It is one of the demyelinating disorders that affects the peripheral nerves in the body.[4] Few case reports and series were published of post-COVID-19 GBS cases.[1,4] These case reports have suggested a relationship between the occurrence of GBS and the recent COVID-19 infection that preceded the GBS onset after a few weeks. Thus, a post-infectious dysregulation of the immune system that is triggered by COVID-19 seems to be the main cause.[2,4] To our knowledge, no case report of post-COVID-19 GBS is published in Oman yet.

Case Report

A 72-years-old gentleman known to have hypertension and ischemic heart disease on treatment had mild COVID-19 infection confirmed on August 17, 2020, which did not require hospitalization as the patient only suffered from mild fever, runny nose and myalgia for only a few days and then were resolved.

The patient presented to our hospital on September 19, 2020, with a one-day history of bilateral lower limb weakness and numbness. The symptoms evolved over few hours, with numbness starting in his feet followed by heaviness in his legs and inability to walk. He noted upper limbs weakness and numbness. Also, he reported mild dysphagia started few days prior to the symptoms. He denied any difficulty in breathing, no new urinary symptoms and had normal bowel motions. There was no past medical history of any neurological symptoms. He denied any history of smoking or alcohol consumption.

On admission, he was alert, oriented and not in pain or distress. His heart rate was 56/minute, blood pressure of 162/96 mmHg, respiratory rate of 18/minute and oxygen saturation of 100% on room air. His random blood sugar was 6.3 mmol/L. The neurological examination showed normal cranial nerves. Motor exam in the upper limbs was normal except for diminished reflexes. The

tone in the lower limb was reduced. His strength, measured by Medical Research Council (MRC) Scale, revealed hip flexion of 2/5, knee flexion 3/5, knee extension -4/5, planters and dorsiflexion of the ankles -4/5. Reflexes in the lower limbs were diminished, and planters were down-going. Sensory examination was normal apart from a decrease in the joint-position sense in the toes. Coordination of the upper limbs was normal and was not examined in lower limbs in view of the weakness.

The laboratory investigations included normal Complete blood Count (CBC), Urea & electrolyte (U&E), coagulation profile, Liver Function Test (LFT), Thyroid Function Test (TFT) & serum folate. C-reactive protein level was < 1 mg/L (reference range 0-5 mg/L). Creatine kinase 340 U/L (reference range 39-308 U/L). Vitamin B12 level was 128 pmol/L (reference range 138-652 pmol/L). Nasopharyngeal SARS-CoV-2 PCR detected during admission. Chronic hepatitis screen, HIV1&2 Ag/Ab, syphilis screen, blood culture, and urine microscopy, culture & sensitivity (MCS) were all negative. His cerebrospinal fluid analysis showed proteins of 2.70 g/L (reference range 0.15-0.45 g/L) with no leucocytes; however, PCR & autoantibodies were not tested.

On the third day of admission, the Nerve conduction study (NCS) Table 1 (Motor Nerve Conduction) showed decrease in Compound Muscle Action Potential amplitude from multiple nerves in upper and lower limbs with prolonged distal motor latencies and reduced velocities. The F-waves in Table 2 (F-Wave Studies) were present in most of the nerve tested, but they were in the upper range. There was no conduction block or temporal dispersion. Table 3 (Sensory Nerve Conduction) revealed a reduction in sensory nerves action potential amplitudes from upper limbs nerves with reduced velocities. However, the sural nerve studies were normal. These findings suggest diffuse motor and sensory neuropathy but predominant in demyelinating changes. His MRI of the brain and spinal cord showed no acute changes.

During admission, the patient's upper limb weakness worsened with shoulder abduction 2/5 bilaterally, elbow extension 3/5, elbow flexion -4/5 and intrinsic hand muscles were 4/5. The patient was diagnosed with post-COVID-19 GBS. Therefore, he was given one course of Intravenous Immunoglobulin (IVIG) 0.4g/kg/day for 5 days. In addition, the patient received Hydrocortisone 10 mg tablet once daily, Neurobion 3 ml injection daily for 4 days and extensive

physiotherapy during admission. He showed a slow but progressive improvement in his symptoms during admission. On September 29th 2020, the discharge day, the patient's neurological examination was normal apart from the minimal weakness of his limbs. The consent has been obtained from the patient for publication.

Discussion

The immune-mediated nature of GBS is mostly based on observational studies on Campylobacter jejuni induced GBS and the fact that immunotherapy has a central role in the management of GBS.[6-12]

GBS is well documented to be seen following a number of infections like Campylobacter jejuni, Mycoplasma, Epstein Barr Virus (EBV), Cytomegalovirus (CMV), and recently the zika virus.[7, 13-15] The most common variant is acute inflammatory demyelinating polyneuropathy (AIDP) among other variants.[6,16-17] Developing polyneuropathies because of any viral infection suggests molecular mimicry leading to neural inflammatory reaction, or even present as a role of an inflammatory response syndrome.[20,21] However, these mechanisms of COVID-19 related neuropathy need to be studied more deeply.[21]

From the published case reports, the predominant clinical presentation of GBS induced by Covid-19 is the classical sensorimotor GBS. In addition, the majority of the cases fulfilled the electrophysiological criteria for a diagnosis of AIDP. There is a male predominance in the reported cases, and it happened across a wide range of ages from 11-94 years old patients. However, the mean age of patients was 55, with the majority of cases occurring in patients older than 40 years. Most of the reported cases had a post-infectious onset of GBS, while few cases reported para-infectious onset of GBS. Hence, GBS induced by Covid-19 seems to generally follow similar trends to the classical post-infectious GBS that is induced by other infective organisms.[21]

Our case of GBS seems to be a post-infectious phenomenon, as it manifested after the resolution of the initial COVID-19 infection. Our patient's mild course of COVID-19 is in keeping with some of the cases already reported in the literature.[22] However, GBS has been reported to occur even after severe form of COVID-19.[1,4] This might be interpreted to be an AIDP variant.[20]

In comparison to our patient's significant improvement following the IVIG course, a case of para-infectious GBS due to COVID-19 failed to respond to IVIG with weakness progression, his respiratory vital capacity dropped, and he required intubation with ICU admission in the United Kingdom (UK).[1] Worsening of such cases could be due to direct invasion of toxins from the COVID-19 virus or related to the severity of pneumonia. However, there was no difference in response to IVIG or plasma exchange between para-infectious and post-infectious GBS in COVID-19 cases as per the few reported cases in the literature.[4]

Although RNA was detected in the nasopharyngeal swab, it is unclear evidence of active infection as it just represents the shedding of viral RNA.[18-19] Moreover, seroconversion to IgG antibodies was detected in our patient. And taking into consideration that our patient responded to the IVIG course, given this favors the conclusion that GBS, in this case, is a post-infectious immune-mediated phenomenon.

Conclusion

As post-COVID-19 GBS is becoming increasingly apparent, larger studies are needed to better characterize the illness, including its clinical presentation. In particular, the effectiveness of IVIG or plasma exchange in para-infectious and post-infectious cases. Therefore, it is important to report cases of GBS induced by Covid-19 to build up the worldwide cumulative evidence base needed for the best approach to the management of similar cases. Moreover, case reports of GBS induced by Covid-19 in the Middle East are limited, so case reports need to be published so we can detect any possible differences in the presentation or management of future cases between different populations.

It is also important to recognize that GBS could be important comorbidity in critically ill COVID-19 patients and should be considered in patients not improving despite improvement of other clinical parameters, especially when the chest imaging is not consistent with the poor respiratory status of the patient.

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Table 1: Motor Nerve Conduction

Nerve And Site	latency	Amplitude	Segment	latency difference	Distance	conduction velocity
Median.R						
Wrist	5.8 ms	6.8 mV	Abductor Pollicis Brevis -Wrist	5.8 ms	mm	m/s
Elbow	11.7 ms	5.5 mv	Wrist-Elbow	5.9 ms	270 mm	46 m/s
Ulnar.R						
Wrist	4.3 ms	6.5 mV	Aductor Digiti Minimi (Manus) -Wrist	4.3 ms	mm	m/s
Below Elbow	9.2 ms	5.6 mV	Wrist- Below Elbow	4.9 ms	250 mm	51 m/s
Median.L						
Wrist	5.7 ms	6 mV	Abductor Pollicis Brevis -Wrist	5.7 ms	mm	m/s
Elbow	11.3 ms	5.5 mv	Wrist- Below Elbow	5.6 ms	230 mm	41 m/s
Ulnar.L						
Wrist	4.2 ms	6 mV	Abductor Digiti Minimi (Manus) -Wrist	4.2 ms	mm	m/s
Below Elbow	8.5 ms	5.3 mV	Wrist-Below Elbow	4.3 ms	250 mm	58 m/s
Tibila.R						
Ankle	7.6 ms	3.5 mV	Abductor Hallucis- Ankle	7.6 ms	mm	m/s
Popliteal Fossa	21.5 ms	1.7 mV	Ankle- Popliteal Fossa	13.9 ms	440 mm	32 m/s
Peroneal.R						
Ankle	8.3 ms	0.4 mV	Extensor Digitorum Brevis- Ankle	8.3 ms	mm	m/s
Fibula (Head)	18.9 ms	0.3 mV	Ankle-Fibula (Head)	10.6 ms	320 mm	30 m/s
Peroneal.R						
Fibula (Head)	4.5 ms	3.4 mV	Tibialis Anterior-Fibula (Head)	4.5 ms	mm	m/s
Popliteal Fossa	6.3 ms	3.1 mV	Fibula (Head)- Popliteal Fossa	1.8 ms	80 mm	44 m/s
Tibila.L						
Ankle	8.2 ms	0.9 mV	Abductor Hallucis- Ankle	8.2 ms	mm	m/s
Popliteal Fossa	21.8 ms	0.6 mV	Ankle- Popliteal Fossa	13.6 ms	440 mm	32 m/s
Peroneal.L						
Ankle	10.3 ms	2.1 mV	Extensor Digitorum Brevis- Ankle	10.3 ms	mm	m/s
Fibula (Head)	19.3 ms	1.6 mV	Ankle-Fibula (Head)	9 ms	320 mm	36 m/s
Peroneal.L						
Fibula (Head)	2.7 ms	3.2 mV	Tibilais Anterior- Fibula (Head)	2.7 ms		
Popliteal Fossa	4.9 ms	3.3 mV	Fibula (Head) Popliteal Fossa	2.2 ms	80 mm	36 m/s

Table 2: (F-Wave Studies)

Nerve	M-Latency	F- Latency
Median.R	7	35.9
Ulnar.R	5	39.7
Median.L	7.7	34.8
Ulnar.L	4.7	37.9
Tibial.R	8.9	53.3
Peroneal.R	9.7	67.9
Tibial.L	8.2	0
Peroneal.L	11.3	63.5

Table 3: Sensory Nerve Conduction

Nerve and Site	Onsent Latency	Peak Latency	Amplitude	Segment	Latency Difference	Distance	Conduction velocity
Median.R							
Wrist	3.9 ms	4.7ms	8 µ V	Digit II (Index finger) - Wrist	3.9 ms	140 mm	36 m/s
Ulnar.R							
Wrist	3 ms	4.4 ms	8 µ V	Digit v (little finger) - Wrist	3 ms	110 mm	37 m/s
Median.L							
Wrist	3.7 ms	4.8 ms	11 µ V	Digit II (Index finger) - Wrist	3.7 ms	140 mm	38 m/s
Ulnar.L							
Wrist	3.2 ms	4.1 ms	8 µ V	Digit v (little finger) - Wrist	3.2 ms	110 mm	35 m/s
Sural.R							
Lower leg	2.6 ms	3.7 ms	10 µ V	Ankle- Lower leg	2.6 ms	120 mm	46 m/s
Sural.L							
Lower leg	2.3 ms	3.3 ms	15µ V	Ankle- Lower leg	2.3 ms	120 mm	52m/s