




CASE REPORT

Guillain-Barré syndrome after mRNA-1273 (Moderna) COVID-19 vaccination: A case report

Zauraiz Anjum¹ | Charoo Iyer¹ | Sidra Naz²  | Vikash Jaiswal³  |
Gaurav Nepal⁴  | Maryrose Laguio-vila¹ | Sanjay Anandaram¹ | Sahil Thapaliya⁴

¹Rochester General Hospital, Rochester, New York, USA

²Harvard Medical School, Boston, Massachusetts, USA

³AMA school of medicine, Makati, Philippines

⁴Tribhuvan University Institute of Medicine, Kathmandu, Nepal

Correspondence

Gaurav Nepal, Tribhuvan University Institute of Medicine, Maharajgunj, Kathmandu 44600, Nepal.
Email: gauravnepal@iom.edu.np

Funding information

This study did not receive any grants

Abstract

Guillain-Barre syndrome (GBS) is an acquired inflammatory polyradiculoneuropathy that often follows infection with a virus or bacteria and in rare occasions, vaccination may precede GBS. We present a case of 80-year-old male patient who presented with chief complaints of progressive, ascending bilateral lower extremity paresthesia and weakness following first dose of Moderna vaccine. His symptoms got exacerbated after 2nd dose. Clinical examination and investigation findings including lumbar puncture, nerve conduction study, and electromyography were consistent with the diagnosis of GBS. The patient received treatment with intravenous immunoglobulin and there was significant improvement toward the end of 5th day. Though rare, this case report suggest that physician should remain vigilant for GBS following COVID-19 vaccination.

KEYWORDS

COVID-19, GBS, Moderna, mRNA, vaccine

1 | INTRODUCTION

Guillain-Barre Syndrome is an acquired inflammatory polyradiculoneuropathy that often emerges as a result of recent infections. Infection with *Campylobacter jejuni*, *Mycoplasma pneumoniae*, Cytomegalovirus, Zika virus, Influenza virus, and influenza vaccine injection are all common GBS triggers.^{1,2} GBS has also been reported during or after COVID-19 infection, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).³ A worldwide mass vaccination operation has been underway to combat COVID-19 since the beginning of 2021. COVID-19 vaccine-related GBS is becoming more common as the COVID-19 vaccination program spreads around the world. GBS has been linked to both messenger-RNA and

adenovirus-vectored COVID-19 vaccines.^{4,5} Here, we describe a case of GBS developing after receiving the first dose of mRNA-1273 (Moderna COVID-19 vaccine). In this case, the temporal linkage between mRNA-1273 immunization and GBS development suggested a vaccine-induced etiology, and the clinical consequences of this link merit further investigation.

2 | CASE PRESENTATION

An 80-year-old male patient presented to emergency room with chief complaints of progressive, ascending bilateral lower extremity paresthesia, and weakness following COVID-19 (Moderna) vaccine. He received his first dose

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2022 The Authors. *Clinical Case Reports* published by John Wiley & Sons Ltd.

of Moderna vaccine in the last week of January 2021, following which he noticed bilateral lower extremity paresthesia (tingling and numbness), which was followed by progressive bilateral lower limb distal weakness, beginning at his feet and then ascending to involve his legs, knees, and hips. He was unable to maintain balance and started having multiple falls prompting him to start using a walker for ambulation. He then received the second dose of his vaccine in February 2021. The next morning, he was unable to get out of his bed due to severe bilateral lower extremity weakness, and he therefore presented to the emergency room.

The patient's past medical history was notable for COVID-19 infection the previous year, from which he had an uneventful recovery, chronic lymphocytic leukemia (CLL) without the end organ involvement for which he had not received any treatment, degenerative disease of lumbar spine, remote history of TIA, hypertension, and hyperlipidemia. The patient denied recent trauma, exposure to drugs / toxins, recent infection, auto-immune disease, family history of hereditary neuropathy or personal history of smoking, alcohol, and drug dependence.

On examination, vitals were notable for mild hypertension, temperature of 101.4 F. Neurological examination was notable for intact power and sensations in bilateral upper limbs, normal bilateral brachioradialis, and triceps and biceps reflexes. In lower extremity, power was 2/5 at all ankle, knee, and hip joints. Bilateral ankle reflexes were absent, and patellar reflexes were markedly reduced left knee, absent in right knee. Sensation to light touch was decreased from knee downwards. Proprioception diminished in bilateral toes. Higher mental function and cranial nerves were intact. General, cardiovascular, respiratory, and abdominal examination were otherwise normal.

Laboratory findings were notable for lymphocyte predominant leukocytosis (in the setting of CLL). Computed tomography (CT) head was negative for any mass occupying lesion or infarct or hemorrhage (Figure 1). Magnetic resonance imaging (MRI) of lumbar spine without IV contrast showed findings consistent with degenerative disease (Figure 2). Infectious work-up including blood culture and urine analysis was negative. Lumbar puncture was done, which showed colorless cerebrospinal fluid (CSF) with albuminocytological dissociation.

The patient's CSF findings of albumin-cytological dissociation along with his classic presentation of rapidly progressive ascending bilateral lower limb weakness, with diminished deep tendon reflexes and sensory loss were concerning for acute inflammatory demyelinating polyneuropathy (AIDP). Accordingly, patient was started on intravenous immunoglobulin (IVIG) at 400 mg/kg/day for 5 days. Patient tolerated this well without any side effects or laboratory abnormalities. Daily negative inspiratory

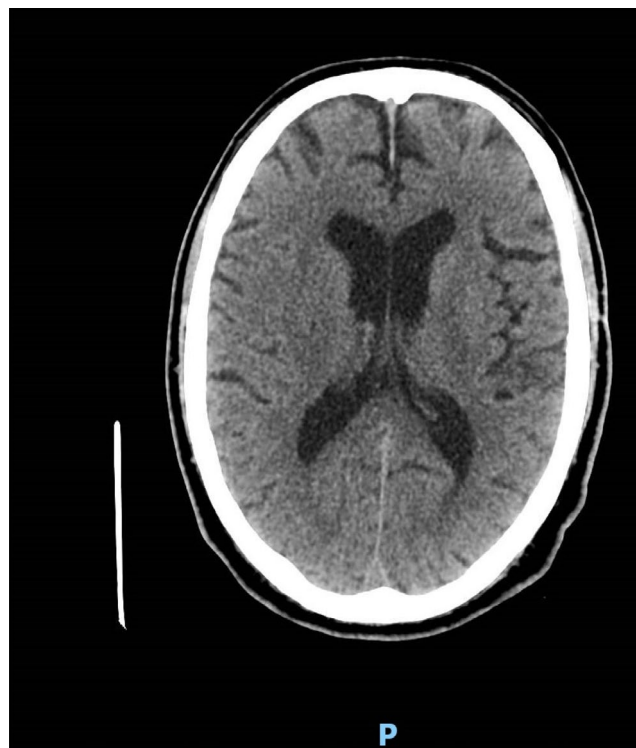


FIGURE 1 Head computed tomography showing normal scan

force (NIF) test was done and remained negative throughout. Toward the end of his 5 days of IVIG therapy, the patient noted significant improvement in bilateral lower extremity strength, and began to ambulate with help from physical therapy. Power in hip flexors was +2 on the right and improved to +3 on the left, though he still had some residual dorsiflexion and plantar flexion weakness in the right foot. The patient was discharged to rehabilitation facility. He underwent outpatient nerve conduction study (NCS) (Figure 3) and electromyography (EMG) (Figure 4), which showed widespread demyelinating polyneuropathy affecting the lower extremities more than the upper extremities, consistent with AIDP. There was an evidence of reinnervation without ongoing denervation on EMG which often indicates that AIDP is in the recovery stage. The patient has been making slow but steady recovery in terms of his strength and ambulation since then.

3 | DISCUSSION

Guillain-Barré syndrome (GBS) is a rare, but potentially fatal, immune-mediated disease of the peripheral nerves and nerve roots that is usually triggered by infections. The pathogenesis involves molecular mimicry, with the immune response elicited by an antecedent trigger (infection or vaccine) cross-reacting with the structural components of peripheral nerves.^{1,5} The resulting demyelination

characteristically presents as symmetric muscle weakness and depressed or absent deep tendon reflexes that progresses over a period of a couple of weeks. Diagnosis is suspected based on the clinical features, with albuminocytological dissociation seen on CSF analysis providing additional supportive evidence. Confirmation and further

stratification into various subtypes can be done with the help of electrodiagnostic studies (EMG and NCS) and CSF antibody tests.^{2,6}

The most common and well-established trigger for GBS is *C. jejuni* infection.^{7,8} GBS has also been associated with viral infections, notably human immuno deficiency virus, Epstein Barre virus, influenza virus, cytomegalo virus, and Zika virus, though a clear causal relationship has not been established.¹ Although infection is the common trigger, a small percentage of patients have been noted to develop GBS following other inciting events, including immunization.⁶ The vaccine that has been most discussed in this regard is the influenza vaccine, with reports of its association with GBS emerging after a 1976 vaccination program in New Jersey⁹ since then multiple studies have reported an association surrounding this.¹⁰⁻¹² Cases of GBS have also been reported after recombinant Zoster, quadrivalent meningococcal, and tetanus toxoid vaccinations.^{1,13}

The ongoing COVID-19 pandemic has raised the concern of possible association between COVID-19 infection and GBS.^{14,15} The subsequent COVID-19 vaccination drives and the VAERS (Vaccine Adverse Event Reporting System) have also led to questions regarding COVID-19 vaccine being a potential trigger for GBS.¹⁶ From immunization standpoint, in the United States, two mRNA vaccines the BNT162b2 (Pfizer-BioNTech COVID-19 vaccine) and the COVID-19 mRNA vaccine mRNA-1273 (Moderna COVID-19 vaccine) as well as the adenoviral vector vaccine Ad26.COVS.2 (Janssen or the Johnson & Johnson vaccine) are in use for the prevention of COVID-19. The adeno

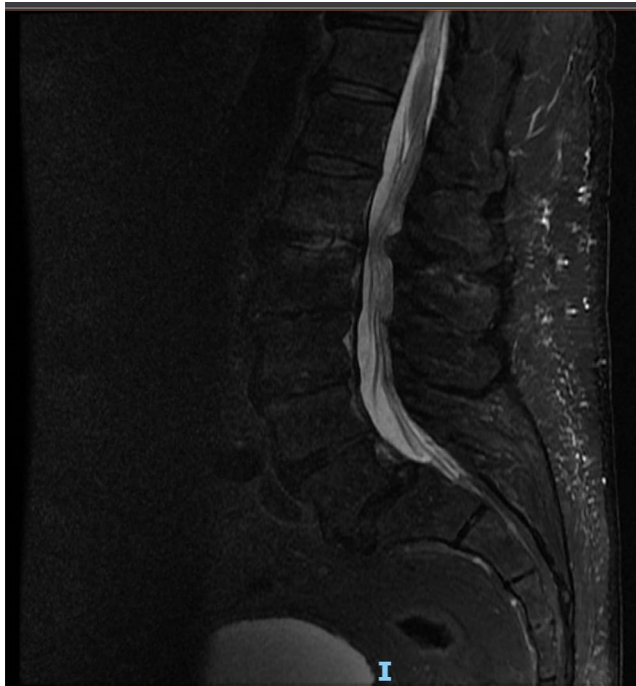


FIGURE 2 Magnetic resonance imaging of lumbar spine showing degenerative changes

Nerve Conduction Studies									
Anti Sensory Summary Table									
Stim Site	NR	Onset (ms)	Peak (ms)	O-P Amp (µV)	Site1	Site2	Delta-0 (ms)	Dist (cm)	Vel (m/s)
Right Radial Anti Sensory (Snuff Box)									
Wrist		2.3	*3.0	*13.2	Wrist	Snuff Box	2.3	10.0	*43
Right Sup Fibular Anti Sensory (Ant Lat Mall)									
14 cm		NR	NR	NR	14 cm	Ant Lat Mall	11.2	14.0	NR
Right Sural Anti Sensory (Lat Mall)									
Calf		2.7	3.4	5.6	Calf	Lat Mall	2.7	0.0	
Motor Summary Table									
Stim Site	NR	Onset (ms)	O-P Amp (mV)	Site1	Site2	Delta-0 (ms)	Dist (cm)	Vel (m/s)	
Right Dp Br Fibular Motor (AntTibialis)									
Fib		*4.5	2.9	Poplit	Fib Head	1.6	8.0	50	
Head		*6.1	2.8						
Right Fibular Motor (Ext Dig Brev)									
Ankle		*7.3	*1.7	B Fib	Ankle	6.6	31.0	47	
B Fib		13.9	1.3	Poplit	B Fib	2.7	8.0	30	
Poplit		16.6	0.9						
Right Tibial Motor (Abd Hall Brev)									
Ankle		4.3	4.5	Knee	Ankle	9.8	40.0	41	
Knee		14.1	3.4						
F Wave Studies									
NR	F-Lat (ms)	L-R F-Lat (ms)							
Left Fibular (Ext Dig Brev)									
	40.67								
Left Tibial (Abd Hallucis)									
	NR								

FIGURE 3 Nerve conduction studies of both sensory and motor nerves

EMG

Side	Muscle	Nerve	Root	Ins Act	Fibs	Psw	Amp	Dur	Poly	Recr	Int Pat	Comment
Right	AntTibialis	Dp Br Fibular	L4-5	Nml	Nml	Nml	Nml	*>12ms	*1+	Nml	Nml	
Right	Gastroc	Tibial	S1-2	Nml	Nml	Nml	Nml	*>12ms	*1+	Nml	Nml	
Right	VastusLat	Femoral	L2-4	Nml	Nml	Nml	Nml	Nml	0	Nml	Nml	
Right	TensorFascLat	SupGluteal	L4-5, S1	Nml	Nml	Nml	Nml	Nml	0	Nml	Nml	
Right	Semitendinosus	Sciatic	L5-S2	Nml	Nml	Nml	Nml	Nml	0	Nml	Nml	
Right	L4-L5 PSP	Rami	L4-L5	Nml	Nml	Nml	Nml	Nml	0	Nml	Nml	
Right	1stDorint	Ulnar	C8-T1	Nml	Nml	Nml	Nml	Nml	0	Nml	Nml	

FIGURE 4 Electromyography studies of selected muscles

virus vaccine ChAdOx1 nCoV-19/AZD1222 (Astrazeneca) is being used in the United Kingdom, Canada, and India.¹⁷

There are multiple cases of GBS being reported following the adenovirus vaccine administration.¹⁸ As of July 24, 2021, 130 reports of presumptive GBS were identified in VAERS following Ad26.COVS.2.S vaccination.¹⁹ In Europe until June 2021, around 227 cases of GBS have been noted after administration, of around 51 million doses of the AstraZeneca vaccine.²⁰ There does not seem to be the same degree of association between the mRNA vaccine and the development of GBS, though a couple of cases have been reported.¹⁸

Our patient did have antecedent history of COVID-19 infection; however, he made a fairly uneventful recovery from this and it was nearly 3 months prior to his presentation with GBS. He started noticing bilateral lower extremity weakness only shortly after his first dose of Moderna Vaccine, which progressed acutely after the second dose, showing a clear temporal association. Other causes were excluded based on history, examination, and radiological/laboratory investigations as noted. The CSF findings of albuminocytological dissociation and the clinical response to IVIG therapy further supports the diagnosis of GBS while the EMG/NCS findings confirm it. This is one of the few reported case of AIDP following Moderna vaccine administration. This case does serve as important reminder to be on the lookout for similar cases and to consider COVID-19 vaccination as a possible differential in GBS cases presenting to various clinical settings.

4 | CONCLUSION

We describe a case of GBS following the administration of mRNA-1273 (Moderna) vaccine against COVID-19. Though the association between mRNA vaccine and development of GBS is yet to be determined, GBS should be considered as a possible differential on the lookout for similar cases following vaccination.

ACKNOWLEDGEMENT

Not applicable.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

AUTHOR CONTRIBUTIONS

ZA, CL, ML, and SA were involved in patient care (diagnosis, treatment, and follow-up). ZA, GN, CL, SN, VJ, ML, and SA contributed to the collection of case information, writing of the manuscript, and manuscript revision. ZA, GN, CL, and ST were involved in revising the manuscript critically for important intellectual content. All authors approved the final version.

ETHICAL APPROVAL

This study did not include experiments on animals or humans. The patient gave consent to use his details for this case study.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

DATA AVAILABILITY STATEMENT

The data used in the case report are available on reasonable request.

ORCID

Sidra Naz  <https://orcid.org/0000-0001-6390-9658>

Vikash Jaiswal  <https://orcid.org/0000-0002-2021-1660>

Gaurav Nepal  <https://orcid.org/0000-0001-5054-2711>

REFERENCES

- Willison HJ, Jacobs BC, van Doorn PA. Guillain-Barré syndrome. *Lancet*. 2016;388(10045):717-727.

2. Leonhard SE, Mandarakas MR, Gondim FAA, et al. Diagnosis and management of Guillain-Barré syndrome in ten steps. *Nat Rev Neurol*. 2019;15(11):671-683. <https://pubmed.ncbi.nlm.nih.gov/31541214>
3. Nepal G, Rehrig JH, Shrestha GS, et al. Neurological manifestations of COVID-19: a systematic review. *Crit Care*. 2020;24(1):421. doi:10.1186/s13054-020-03121-z
4. Oo WM, Giri P, de Souza A. AstraZeneca COVID-19 vaccine and Guillain-Barré syndrome in Tasmania: a causal link? *J Neuroimmunol [internet]*. 2021;360:577719. <https://pubmed.ncbi.nlm.nih.gov/34560365>
5. Shapiro Ben David S, Potasman I, Rahamim-Cohen D. Rate of recurrent Guillain-Barré syndrome after mRNA COVID-19 vaccine BNT162b2. *JAMA Neurol*. 2021;78(11):1409-1411. doi:10.1001/jamaneurol.2021.3287
6. Yuki N, Hartung H-P. Guillain-Barré syndrome. *N Engl J Med*. 2012;366(24):2294-2304. doi:10.1056/NEJMr1114525
7. Allos BM. *Campylobacter jejuni* infection as a cause of the Guillain-Barré syndrome. *Infect Dis Clin North Am*. 1998;12(1):173-184.
8. McCarthy N, Giesecke J. Incidence of Guillain-Barré syndrome following infection with *Campylobacter jejuni*. *Am J Epidemiol*. 2001;153(6):610-614. doi:10.1093/aje/153.6.610
9. Babazadeh A, Mohseni Afshar Z, Javanian M, et al. Influenza vaccination and Guillain-Barré syndrome: reality or fear. *J Transl Intern Med*. 2019;7(4):137-142.
10. Souayah N, Yacoub HA, Khan HMR, et al. Guillain-Barré syndrome after H1N1 vaccination in the United States: a report using the CDC/FDA vaccine adverse event reporting system (2009). *Neuroepidemiology*. 2012;38(4):227-232.
11. Souayah N, Nasar A, Suri MFK, Qureshi AI. Guillain-Barré syndrome after vaccination in United States: data from the Centers for Disease Control and Prevention/Food and Drug Administration Vaccine Adverse Event Reporting System (1990-2005). *J Clin Neuromuscul Dis*. 2009;11(1):1-6. doi:10.1097/CND.0b013e3181aaa968
12. Martín Arias LH, Sanz R, Sáinz M, Treceño C, Carvajal A. Guillain-Barré syndrome and influenza vaccines: a meta-analysis. *Vaccine*. 2015;33(31):3773-3778.
13. Haber P, Sejvar J, Mikaeloff Y, DeStefano F. Vaccines and Guillain-Barré syndrome. *Drug Saf*. 2009;32(4):309-323.
14. Shrestha GS, Khanal S, Sharma S, Nepal G. COVID-19: Current Understanding of Pathophysiology. *J Nepal Health Res Council*. 2020;18(3):351-359.
15. Toscano G, Palmerini F, Ravaglia S, et al. Guillain-Barré syndrome associated with SARS-CoV-2. *N Engl J Med*. 2020;382:2574-2576.
16. Dufour C, Co T-K, Liu A. GM1 ganglioside antibody and COVID-19 related Guillain Barre syndrome – A case report, systemic review and implication for vaccine development. *Brain Behav Immun Health*. 2021;12:100203. <https://www.sciencedirect.com/science/article/pii/S2666354621000065>
17. Wu Q, Dudley MZ, Chen X, et al. Evaluation of the safety profile of COVID-19 vaccines: a rapid review. *BMC Med*. 2021;19(1):173. doi:10.1186/s12916-021-02059-5
18. Hanson KE, Goddard K, Lewis N, et al. Guillain-Barré syndrome after COVID-19 vaccination in the vaccine safety datalink. *medRxiv*. 2021. <http://medrxiv.org/content/early/2021/12/05/2021.12.03.21266419.abstract>
19. Woo EJ, Mba-Jonas A, Dimova RB, Alimchandani M, Zinderman CE, Nair N. Association of receipt of the Ad26.COV2.S COVID-19 vaccine with presumptive Guillain-Barré syndrome, February-July 2021. *JAMA*. 2021;326(16):1606-1613.
20. Maramattom BV, Krishnan P, Paul R, et al. Guillain-Barré syndrome following ChAdOx1-S/nCoV-19 vaccine. *Ann Neurol*. 2021;90(2):312-314.

How to cite this article: Anjum Z, Iyer C, Naz S, et al. Guillain-Barré syndrome after mRNA-1273 (Moderna) COVID-19 vaccination: A case report. *Clin Case Rep*. 2022;10:e05733. doi:10.1002/ccr3.5733