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Case Report

GUILLAIN-BARRÉ SYNDROME AND COVID-19 VACCINATION: A DISCONCERTING ASSOCIATION

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ABSTRACT

Guillain-Barré syndrome (GBS) is an acute, inflammatory peripheral nerve disorder characterized by rapidly progressive, ascending, symmetrical paresthesia, and motor weakness. Some patients may develop respiratory failure requiring ventilation. The annual incidence of GBS is ~1.7 persons per 100,000 population. We describe the case of a 61-year-old male complaining of headache, one episode of vomiting, giddiness, slight slurring of speech, and inability to close his left eyelid. The patient received intravenous immunoglobulin therapy, with improvement in his symptoms at the time of discharge. In addition, we have also summarized 41 cases of GBS reported on post-COVID-19 vaccination. The intention of this case report is to highlight on the incidence of GBS in individuals who have received COVID-19 vaccine. Moreover, physicians should be aware of GBS in every patient presenting with neurological complaints on OPD.

Keywords: Guillain-Barre syndrome, Acute inflammatory demyelinating polyneuropathy, COVID-19, COVID-19 vaccine, Adenoviruses – vector vaccine, Messenger-RNA vaccine.

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INTRODUCTION

Guillain-Barre syndrome (GBS) is a rare, autoimmune disorder of the peripheral nerves characterized by elevated cerebrospinal fluid (CSF) protein, muscle weakness, numbness, and tingling sensation followed by progressive paralysis. Risk of GBS post-vaccination was found to be a significant concern in individuals administered with both adenovirus – vector vaccine and messenger-RNA vaccine. This type of risk was confronted previously in the year 1976 during the swine influenza vaccination program. Even after four decades, there is inconclusive evidence for the possible association between vaccines and GBS [1]. Herein, we report a case of acute inflammatory demyelinating polyneuropathy (AIDP) – GBS presenting to the hospital in Chennai, India, 2 weeks following administration of Oxford – AstraZeneca COVID-19 vaccine. This vaccine contains a viral vector of the modified chimpanzee adenovirus ChAdOx1 with SARS-CoV-2 spikes protein on the outer surface that generates immunity against SARS-CoV-2 infection. In India, this vaccine is manufactured and distributed by the Serum Institute of India in the brand name of Covishield.

CASE REPORT

A 61-year-old male patient visited the emergency department with a history of headache, one episode of vomiting, giddiness, slight slurring of speech, and inability to close his left eyelid since the previous night. Subsequently, he experienced progressing complaints on the 2nd day, such as numbness, burning sensation, weakness in extremities, neck pain, sleep disturbance, poor saliva secretion, pain over the left periauricular region, and breathing difficulty. On the 3rd day of admission, weakness on the left side of his face increased and was unable to walk. He had a history of hypertension (1 year) and was on regular antihypertensive therapy. The patient did not have any other comorbidities or surgical history at the time of admission. The patient also did not report of any recent episode of respiratory infection or diarrheal illness. Moreover, he never tested positive for COVID-19 and had no family history of autoimmune diseases or COVID-19. His physical examination revealed typical vital signs apart from a 160/90 mm Hg blood pressure reading. Neurological examination findings were consistent with quadriparesis that had a glove and stocking distribution. The power was noted to be 4/5, both in the proximal and distal muscles. Reduced muscle tone with the absence of deep tendon reflexes and plantar response was observed. The above-mentioned symptoms reveal the dysfunction of cerebellum and oculomotor nerve. Other systemic examinations were unremarkable. The patient had received COVID-19 vaccination (ChAdOx1 nCoV-19 vaccines/AstraZeneca) 20 days before his admission.

The patient was working as an electrical engineer. He was a teetotaler and was able to empty his bowels and bladder normally. On admission, the baseline blood investigations including complete blood count, renal function test, serum electrolytes, lipid profile, urine analysis, CSF analysis, and immunology/serological tests were performed to identify the underlying cause of symptoms. In addition, CT and MRI brain-whole spine and nerve conduction study were performed. The investigations revealed elevated levels of HbA1C (7.9%), FBS (219 mg/dl), PPBS (365 mg/dl), triglycerides (212 mg/dl), LDL (147 mg/dl), VLDL (42 mg/dl, CHOL/HDL ratio (5.3 mg/dl), procalcitonin (1.26 ng/ml), ACE (80 U/L) and reduced levels of sodium (131 mmol/L), chloride (94 mmol/L), and platelet (2.34 lakhs/cu mm). CT-chest findings were found to be normal. Urine analysis revealed pale yellow, cloudy urine, acidic, albumin (+), sugar (3+), leukocyte esterase trace, WBC cells (6–8/HPF), and epithelial cells (4–6/HPF). Furthermore, 12-lead ECG revealed that sinus rhythm, possible left anterior fascicular block, and inferior T wave abnormality that was non-specific. The basic peripheral neuropathy screening was performed. Antinuclear antibody (ANA) revealed 1:100 titer, which was considered weak positive. CSF analysis revealed increased glycorrhachia (178 mg/dl) and decreased chloride (11 mEq/l) with normal albuminocytological dissociation. Serologic tests for HIV, hepatitis B/C, and syphilis were negative. Head CT report revealed age-related cerebral atrophy with small vessel ischemic changes. Further, MRI brain with MRA and MRV screening showed few discrete non-diffusion restricting T2/FLAIR hyperintensities in the right corona radiate – non-specific with no other significant abnormality detected. There was no evidence of acute infarct, hemorrhage, or space-occupying mass lesion in the brain. MRI – whole spine screening showed mild disk bulge at C3–C6 levels indenting the thecal sac and hemangioma in D8 vertebral body. The nerve conducting study of

the sensory nerve action potential (SNAP) and the compound muscle action potential report revealed prolonged latencies, which reduced amplitude in both limbs; in additiona, SNAP's amplitude in the bilateral ulna nerve was reduced, and F-waves were prolonged in both limbs, features suggesting sensory-motor neuropathy, and radiculopathy of upper and lower limbs. Initially, he was diagnosed with Bell's palsy and type 2 diabetic mellitus and treated with 30 mg prednisolone once a day for 3 days. However, NCS report confirmed the diagnosis of AIDP-GBS, following which he was provided intravenous immunoglobulin for 5 days with maintenance therapy acyclovir 800 mg every 6th h for 4 days. Unfortunately, his condition gradually deteriorated over a couple of days after IVI g admission. Neuropathic pain was managed by gabapentin 100 mg for 5 days. Regular limb physiotherapy, speech therapy facial electrical stimulation, was given. The patient responded very well to the treatment and showed improvement in limb weakness and numbness. Hence, the patient was discharged after 13 days with conservative management advice. The patient was called for the first follow-up visit 7 days after his discharge. During the second follow-up, the patient showed full recovery with improvements in walking ability and muscle strength.

DISCUSSION

In the history of humankind, vaccination against COVID-19 disease has been the most extensive vaccine campaign worldwide. For the past 2 years, the quest for a vaccine and treatment for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been a high priority. Clinical trials have given us a fair understanding about the safety and efficacy of vaccines in current use. However, anecdotal experiences gained through the bedside also add additional value in our wholesome understanding of the vaccine's safety since a much larger population gets exposed to the vaccine in post marketing scenario, thereby providing us a better vantage point. Three vaccines (Pfizer/BioNTech and Moderna, Janssen) have received emergency use authorization by the U.S. food and drug administration (FDA). Besides this, four vaccines, namely, Oxford/AstraZeneca, Oxford/AstraZeneca – serum institute of India (Covishield), Sinopharm (BBIBP-CorV), and Sinovac (CoronaVac), have received emergency use approval for COVID-19 by W.H.O.

As of July 31, 2021, 592 million doses of AstraZeneca (Vaxzevria) vaccine had been administered, and among those 833 GBS cases were reported by pharmacovigilance risk assessment committee. Similarly, the vaccine adverse events reporting system observed 100 cases of GBS around 12.6 million doses of Janssen COVID-19 vaccinated individual in the U.S [2]. GBS is an acute inflammatory peripheral nerve disorder characterized by rapidly progressive, ascending, symmetrical paresthesia, and motor weakness. Some patients may develop respiratory failure requiring ventilation. The annual incidence of GBS is ~1.7 persons per 100,000 population [3,4]. It can be a fatal disease and may also cause permanent disability. The most common trigger for GBS is gastroenteritis caused by *Campylobacter Jejuni* and others include c*ytomegalovirus,* influenza*, Mycoplasma pneumoniae*, the flaviviruses Zika and dengue, and the alphavirus*,* chikungunya*.* The pathogenesis includes molecular mimicry and production of antiganglioside antibodies. Furthermore, the possibility of GBS on post-SARS-CoV-2 infection was expected due to the initial publication of few cases during the pandemic. However, there was no rise in the number of cases presenting with GBS during the first wave of pandemic, like in the ZIKA virus pandemic. In addition, hepatitis B, polio, tetanus, meningococcus, and rabies vaccine have also been associated with GBS [5].

We made a quick search on PubMed with the keywords, "COVID-19 vaccine, AstraZeneca vaccine, Vaxzevria, Covishield, Covaxin, Pfizer-BioNTech, Moderna, Johnson and Johnson, Janssen and GBS," and the results are shown (Table 1). The first case of GBS post-COVID-19 vaccination was observed with mRNA vaccine (Pfizer-BioNTech) reported by Waheed *et al*. [6]. From the literature, it appears that the incidence of post-vaccination GBS is higher with the adenoviral-vector vaccine (n=28) than mRNA vaccine (n=13). In total, we found 41 GBS cases on post-COVID-19 vaccination. Based on the reports, the European medicines agency and FDA have listed GBS as a side effect of AstraZeneca and Janssen vaccine [7]. Although GBS is rare and even rarer following vaccination, we must remain vigilant to its occurrence. Here, we have reported one case of mild GBS who was vaccinated with first dose of Covishield. Based on NCS, the patient was diagnosed with AIDP. Patients with AIDP–GBS usually present with elevated levels of antiganglioside antibodies, ANA, and CSF-albuminocytological dissociation and changes in MRI and NCS report. Although this case showed positive NCS result, all other antibody tests and MRI were negative, suggesting that this was not a usual case of GBS. When comparing the duration of Covishield vaccination administered to the patient, with the onset of GBS specific symptoms, it appears that the antibodies produced on vaccination may have triggered GBS. Thus, the GBS in this patient may primarily be a vaccine-induced disease. Hence, the patient was treated with standard regimen IVI g for 5 days and got completely recovered on 14th day of discharge. The temporal relationship of GBS following vaccination points to a causal relationship, though this cannot be confirmed with absolute certainty. It could be described as the generation of host antibodies that could cross-react with proteins present in the peripheral myelin, which causes nerve damage and results in nerve symptoms. Nevertheless, the infrequent nature of this event implies that the vaccine should not be denied to the public on account of a possible occurrence of GBS [4]. Meantime, a well-designed and multi-national GBS surveillance programs to collect the incidence rate is warranted. This will help to compare it with a control group (GBS in non-vaccinated people) for critical analysis of cause and real-time incidence rate. CDC announced GBS as a rare event that poses a very minimal risk. The health-care team, pharmaceutical companies, press, and media should educate the general public to understand that GBS may occur by chance during the vaccination window and all are encouraged to report continuously, even a minor side effect, following COVID-19 vaccination. This could help other physicians for the early recognition and treatment for GBS. In addition, it benefits in the collection of evidence regarding the safety of quickly developed COVID-19 vaccine.

CONCLUSION

GBS is a serious adverse event that can occur following COVID-19 vaccination, with the risk slightly higher with adenoviral vector vaccines. However, the infrequent nature of the event should offer some solace to all stake holders and it is essential that all neurological symptoms are noted post vaccination and surveillance is performed adequately so as to gauge the magnitude of the problem. A physician should consider a diagnosis of GBS post vaccination in every patient presenting with headache, lower back pain, facial weakness, and numbness in the lower extremities.

AUTHORS' CONTRIBUTIONS

All authors contributed significantly to the article. The case was diagnosed and reported by Selvin Gnanaraj James. Data collection, literature review, and the first draft of the manuscript were written by Sindhu Shanmugam. The manuscript was reviewed by Melvin George and Damal Kandadai Sriram. All authors read and approved the final manuscript.

CONFLICTS OF INTEREST

Authors did not have any conflict/competing interests

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REFERENCES

1. Vellozzi C, Iqbal S, Broder K. Guillain-Barre syndrome, influenza, and influenza vaccination: The epidemiologic evidence. Clin Infect Dis 2014;58:1149-55. doi: 10.1093/cid/ciu005, PMID 24415636
2. Rosenblum HG, Hadler SC, Moulia D, Shimabukuro TT, Su JR, Tepper NK, *et al*. Use of COVID-19 vaccines after reports of adverse events among adult recipients of Janssen (Johnson and Johnson) and mRNA COVID-19 vaccines (Pfizer-BioNTech and Moderna): Update from the advisory committee on immunization practices-United States, July 2021. MMWR Morb Mortal Wkly Rep 2021;70:1094-9. doi: 10.15585/mmwr.mm7032e4, PMID 34383735
3. Sejvar JJ, Baughman AL, Wise M, Morgan OW. Population incidence of Guillain-Barré syndrome: A systematic review and meta-analysis. Neuroepidemiology 2011;36:123-33. doi: 10.1159/000324710, PMID 21422765
4. Keddie S, Pakpoor J, Mousele C, Pipis M, Machado PM, Foster M, *et al*. Epidemiological and cohort study finds no association between COVID-19 and Guillain-Barré syndrome. Brain 2021;144:682-93. doi: 10.1093/brain/awaa433, PMID 33313649
5. Lunn MP, Cornblath DR, Jacobs BC, Querol L, van Doorn PA, Hughes RA, *et al*. COVID-19 vaccine and Guillain-Barré syndrome: Let's not leap to associations. Brain 2021;144:357-60.
6. Waheed S, Bayas A, Hindi F, Rizvi Z, Espinosa PS. Neurological complications of COVID-19: Guillain-Barre syndrome following Pfizer COVID-19 vaccine. Cureus 2021;13:e13426. doi: 10.7759/cureus.13426, PMID 33758714
7. Kanabar G, Wilkinson P. Guillain-Barré syndrome presenting with facial diplegia following COVID-19 vaccination in two patients. BMJ Case Rep 2021;14:e244527. doi: 10.1136/bcr-2021-244527, PMID 34649856
8. Allen CM, Ramsamy S, Tarr AW, Tighe PJ, Irving WL, Tanasescu R, *et al*. Guillain-Barré syndrome variant occurring after SARS-CoV-2 vaccination. Ann Neurol 2021;90:315-8. doi: 10.1002/ana.26144, PMID 34114269
9. Nasuelli NA, De Marchi F, Cecchin M, De Paoli I, Onorato S, Pettinaroli R, *et al*. A case of acute demyelinating polyradiculoneuropathy with bilateral facial palsy after ChAdOx1 nCoV-19 vaccine. Neurol Sci 2021;42:4747-9. doi: 10.1007/s10072-021-05467-w, PMID 34272622
10. Patel SU, Khurram R, Lakhani A, Quirk B. Guillain-Barre syndrome following the first dose of the chimpanzee adenovirus-vectored COVID-19 vaccine, ChAdOx1. BMJ Case Rep 2021;14:e242956. doi: 10.1136/bcr-2021-242956, PMID 33888484
11. Maramattom BV, Krishnan P, Paul R, Padmanabhan S, Nampoothiri SC, Syed AA, *et al*. Guillain-Barré syndrome following ChAdOx1-S/nCoV-19 vaccine. Ann Neurol 2021;90:312-4. doi: 10.1002/ana.26143, PMID 34114256
12. Min YG, Ju W, Ha YE, Ban JJ, Lee SA, Sung JJ, *et al*. Sensory Guillain-Barre syndrome following the ChAdOx1 nCov-19 vaccine: Report of two cases and review of literature. J Neuroimmunol 2021;359:577691. doi: 10.1016/j.jneuroim.2021.577691, PMID 34416410
13. Oo WM, Giri P, De Souza A. AstraZeneca COVID-19 vaccine and Guillain-Barré syndrome in Tasmania: A causal link? J Neuroimmunol 2021;360:577719. doi: 10.1016/j.jneuroim.2021.577719, PMID 34560365
14. Azam S, Khalil A, Taha A. Guillain-Barré syndrome in a 67-year-old male post COVID-19 vaccination (Astra Zeneca). Am J Med Case Rep 2021;9:424-7. doi: 10.12691/ajmcr-9-8-10
15. Hasan T, Khan M, Khan F, Hamza G. Case of Guillain-Barré syndrome following COVID-19 vaccine. BMJ Case Rep 2021;14:e243629. doi: 10.1136/bcr-2021-243629, PMID 34187803
16. Introna A, Caputo F, Santoro C, Guerra T, Ucci M, Mezzapesa DM, *et al*. Guillain-Barré syndrome after AstraZeneca COVID-19-vaccination: A causal or casual association? Clin Neurol Neurosurg 2021;208:106887. doi: 10.1016/j.clineuro.2021.106887, PMID 34418708
17. Kripalani Y, Lakkappan V, Parulekar L, Shaikh A, Singh R, Vyas P. A rare case of Guillain-Barre syndrome following COVID-19 vaccination. Eur J Case Rep Intern Med 2021;8:002707. doi: 10.12890/2021_002797, PMID 34671572
18. McKean N, Chircop C. Guillain-Barré syndrome after COVID-19 vaccination. BMJ Case Rep 2021;14:e244125. doi: 10.1136/bcr-2021-244125, PMID 34330729
19. Finsterer J. Exacerbating Guillain-Barré syndrome eight days after vector-based COVID-19 vaccination. Case Rep Infect Dis 2021;2021:3619131. doi: 10.1155/2021/3619131, PMID 34055430
20. Bouattour N, Hdiji O, Sakka S, Fakhfakh E, Moalla K, Daoud S, *et al*. Guillain-Barré syndrome following the first dose of Pfizer-BioNTech COVID-19 vaccine: Case report and review of reported cases. Neurol Sci 2022;43:755-61. doi: 10.1007/s10072-021-05733-x, PMID 34796417
21. Razok A, Shams A, Almeer A, Zahid M. Post-COVID-19 vaccine Guillain-Barré syndrome; First reported case from Qatar. Ann Med Surg (Lond) 2021;67:102540. doi: 10.1016/j.amsu.2021.102540, PMID 34249353
22. Ogbebor O, Seth H, Min Z, Bhanot N. Guillain-Barré syndrome following the first dose of SARS-CoV-2 vaccine: A temporal occurrence, not a causal association. IDCases 2021;24:e01143. doi: 10.1016/j.idcr.2021.e01143, PMID 33968610
23. Trimboli M, Zoleo P, Arabia G, Gambardella A. Guillain-Barré syndrome following BNT162b2 COVID-19 vaccine. Neurol Sci 2021;42:4401-2. doi: 10.1007/s10072-021-05523-5, PMID 34346014
24. Scendoni R, Petrelli C, Scaloni G, Logullo FO. Electromyoneurography and laboratory findings in a case of Guillain-Barré syndrome after second dose of Pfizer COVID-19 vaccine. Hum Vaccin Immunother 2021;17:4093-6. doi: 10.1080/21645515.2021.1954826, PMID 34347563
25. Nishiguchi Y, Matsuyama H, Maeda K, Shindo A, Tomimoto H. Miller fisher syndrome following BNT162b2 mRNA coronavirus 2019 vaccination. BMC Neurol 2021;21:452. doi: 10.1186/s12883-021-02489-x, PMID 34789193
26. Rao SJ, Khurana S, Murthy G, Dawson ET, Jazebi N, Haas CJ. A case of Guillain-Barre syndrome following Pfizer COVID-19 vaccine. J Community Hosp Intern Med Perspect 2021;11:597-600. doi: 10.1080/20009666.2021.1954284, PMID 34567447
27. Fukushima T, Tomita M, Ikeda S, Hattori N. A case of sensory ataxic Guillain-Barré syndrome with immunoglobulin G anti-GM1 antibodies following the first dose of mRNA COVID-19 vaccine BNT162b2 (Pfizer). QJM 2022;115:25-7. doi: 10.1093/qjmed/hcab296, PMID 34871447
28. Abo-Zed A, Pinevich A. Guillain-Barré syndrome, or acute on chronic inflammatory demyelinating polyneuropathy, following moderna COVID-19 vaccine. Chest 2021;160:A898.
29. Dalwadi V, Hancock D, Ballout AA, Geraci A. Axonal-variant Guillian-Barre syndrome temporally associated with mRNA-based moderna SARS-CoV-2 vaccine. Cureus 2021;13:e18291. doi: 10.7759/cureus.18291, PMID 34722067
30. Matarneh AS, Al-battah AH, Farooqui K, Ghamoodi M, Alhatou M. COVID-19 vaccine causing Guillain-Barre syndrome, a rare potential side effect. Clin Case Rep 2021;9:e04756. doi: 10.1002/ccr3.4756, PMID 34484780
31. Masuccio FG, Comi C, Solaro C. Guillain-Barrè syndrome following COVID-19 vaccine mRNA-1273: A case report. Acta Neurol Belg 2022;122:1369-71. doi: 10.1007/s13760-021-01838-4, PMID 34767184
32. Loza AM, Holroyd KB, Johnson SA, Pilgrim DM, Amato AA. Guillain-Barré syndrome in the placebo and active arms of a COVID-19 vaccine clinical trial: Temporal associations do not imply causality. Neurology 2021;96:1052-4. doi: 10.1212/WNL.0000000000011881
33. Prasad A, Hurlburt G, Podury S, Tandon M, Kingree S, Sriwastava S. A novel case of Bifacial Diplegia variant of Guillain-Barré syndrome following Janssen COVID-19 vaccination. Neurol Int 2021;13:404-9. doi: 10.3390/neurolint13030040, PMID 34449715
34. Jain E, Nuthalapati D, Babar HZ, Bloomfield D. Guillain-Barré syndrome: Inverted paralysis post-operatively in a patient with ulcerative colitis. Cureus 2021;13:e15457. doi: 10.7759/cureus.15457, PMID 34258120
35. Morehouse ZP, Paulus A, Jasti SA, Bing X. A rare variant of Guillain-Barre syndrome following Ad26.COV2.S vaccination. Cureus 2021;13:e18153. doi: 10.7759/cureus.18153, PMID 34703690