Journal of Modern Rehabilitation

Case Report

A Multidisciplinary Extended Approach to Physiotherapy Rehabilitation in Guillain-Barre Syndrome as Sequelae of COVID-19: A Single Case Study

Nikita Kachhwani, Pallavi Bhakaney, Vaishnavi Yadav*

Department of Cardio-Respiratory Physiotherapy, Ravi Nair Physiotherapy College, DMIMS, Sawangi (Meghe), India.

Use your device to scan and read the article online

Citation Kachhwani N, Bhakaney P, Yadav V. A Multidisciplinary Extended Approach to Physiotherapy Rehabilitation in Guillain-Barre Syndrome as Sequelae of COVID-19: A Single Case Study. Journal of Modern Rehabilitation. 2024; 18(2):276-281. http://dx.doi.org/10.18502/jmr.v18i2.15984

http://dx.doi.org/10.18502/jmr.v18i2.15984

Article info:
Received: 19 Jun 2022
Accepted: 9 Oct 2022
Available Online: 01 Apr 2024

Keywords:
Functional independence; Guillain-Barre syndrome; Rehabilitation; Severe acute respiratory syndrome coronavirus 2; SARS-CoV-2

ABSTRACT

Introduction: Coronaviruses can cause widespread systemic infections, the most common of which are respiratory complications, which are close to the symptoms of serious acute respiratory syndrome coronavirus (SARS-CoV).

Case Description: We report a case of a 16-year-old boy who developed weakness in bilateral lower limbs, difficulty in coughing, and generalized weakness for 2 days. He was diagnosed with post-COVID Guillain-Barre syndrome (GBS). Cerebrospinal fluid (CSF) analysis manifested a CSF protein of 117 mg/dL, a white blood cell count of 6-7/mm^3, and a glucose of too low to comment. Magnetic resonance investigation of the brain revealed mucosal thickening in the bilateral maxillary, ethmoid, and left frontal sinuses. Nerve conduction studies concluded evidence of sensory-motor polyneuropathy. Physiotherapy intervention included patient education, breathing retraining, airway clearance techniques, positioning, a combination of chest proprioceptive neuromuscular facilitation (PNF) techniques, a walking program with supplemented oxygen, and psychological support.

Results: Outcome measures have shown enhancement in functional independence and performance of activities of daily living.

Conclusion: The evidence from this study suggests that pulmonary rehabilitation plays a pivotal role in managing a patient who is diagnosed with post-COVID GBS, which includes patient education, breathing retraining, airway clearing techniques, a combination of chest PNF techniques, positioning, a walking program with augmented oxygen, and psychological support.

*** Corresponding Author:**
Vaishnavi Yadav, Assistant Professor.
Address: *Department of Cardio-Respiratory Physiotherapy, Ravi Nair Physiotherapy College, DMIMS, Sawangi (Meghe), India.*
E-mail: *vaishnavi1326@gmail.com*

Introduction

The SARS-CoV-2 outbreak, which started in Wuhan, has now spread and formed variants of the initial virus. Fever and respiratory illness are common symptoms of coronavirus disease 2019 (COVID-19). However, there is a scarcity of knowledge on COVID-19's neural manifestations [1]. Coronaviruses can cause a variety of systemic infections, the most common of which are respiratory complications [2]. In 214 patients infected with COVID-19, Mao et al. [3] examined the neurological symptoms including dizziness, headache, hypogeusia, hyposmia, muscle injury, and hemorrhagic stroke, which were all observed in 36.4% of hospitalized patients. A review done in 2020 focused on the pathogenesis of the virus on the nervous system suggesting 2 mechanisms: Transsynaptic spread and blood-brain-barrier spread. It also mentions the most common manifestations of the nervous system as headache, anosmia, and ageusia with findings of stroke, encephalopathy, peripheral nerve disorders and seizures, and coma [4].

Progressive, ascending, symmetrical flaccid limb paralysis with areflexia or hyporeflexia and with or without cranial nerve involvement are the classic clinical manifestations of Guillain-Barre syndrome (GBS), which can last anywhere from a few days to several weeks. From 2 to 4 weeks before the start of GBS neurological symptoms, two-thirds of patients report a respiratory or gastrointestinal infection [5]. Many studies have reported the association of GBS with the history of COVID-19 [5-8]. One study reports that in post-COVID GBS, most of the variations of GBS have been noticed [9]. Physiotherapists (PTs) are healthcare professionals who manage and care for this group of patients, playing an important role in conservative care and treatment, improvements in posture, functional movement, and weaning intrusive mechanical ventilator assistance [10].

Case Description

A 16-year-old boy developed weakness in bilateral lower limbs, difficulty in coughing, and generalized weakness for 2 days. The patient was hospitalized and reverse transcription polymerase chain reaction (RT-PCR) was done as a compulsory routine test which came out to be negative. However, he did give a positive history of COVID-19, before 6 months. The patient was progressively developing generalized weakness and difficulty in deglutition and soft speech. He was evaluated by a neurologist. Intravenous immunoglobulin was started at 0.4 mg/kg/day as a high suspicion of GBS besides the steroids and supportive care. The patient responded to the treatment. After 4 days, the patient developed swelling on the left side of the neck, chest, and arm; which is evidence of subcutaneous emphysema. Investigations revealed subcutaneous edema of the neck and bilateral shoulder extending up to the abdomen. The patient was having worsening dyspnea. Given the deteriorating condition of the patient, he had undergone endotracheal intubation with volume control mode (tidal volume- 240 mL, PEEP-5, FiO_2- 90%). Pigtail insertion was done in the right fifth intercostal space as routine investigations revealed, post-COVID GBS with pneumothorax with pneumoperitoneum with pneumomediastinum with subcutaneous emphysema. Mode on a mechanical ventilator as synchronized intermittent mechanical ventilation (SIMV) with 200 mL tidal volume and Positive end-expiratory pressure (PEEP-5) maintaining 100% SPO_2. A call for physiotherapy was given, as the findings revealed the development of ventilator-associated pneumonia (VAP). He required ventilation for more than 8 days. Thus, a tracheostomy was done after 8 days and the pigtail was removed after 5 days. The important timeline is mentioned in Table 1.

On examination, inspection showed that the patient was on mechanical ventilator mode volume control, tidal volume of 240, PEEP-5, FiO_2 of 90%, use of accessory

Table 1. Timeline of the patient

Measure	Date
Admission	20/9/2021
Intubation	2/10/2021
Physiotherapy referral	4/10/2021
Discharge	25/11/2021
Last follow-up	1/12/2021

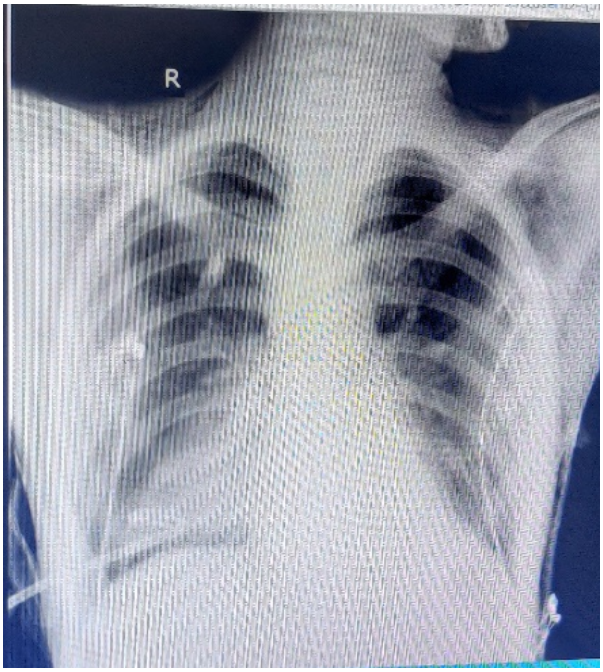

Figure 1. Chest x-ray- homogenous opacity in right lower zone

JMR

muscles present while breathing and clubbing grade-3. Systemic examination revealed a pulse rate of 130 beats/min, blood pressure of 130/90 mmHg, SPO_2 of 98% (on ventilator), respiratory rate of 36 breaths/min with regular rhythm, and abdomino-thoracic type of breathing. Chest excursion was bilaterally decreased, percussion revealed bilateral dull notes all over the lung fields and auscultation showed bilateral crepitations all over the lung fields. Neurological examination revealed intact cranial nerves, and reflexes, with no ankle and knee jerk plantar reflex. Muscle tone was flaccid in both lower limbs and manual muscle testing showed 0/5 in both lower limbs.

Abnormal findings in electrophysiological tests and a combination of an elevated protein level and normal cell count in cerebrospinal fluid are typical diagnostic markers of GBS [11]. In this case, cerebrospinal fluid (CSF) analysis showed a CSF protein of 117 mg/dL, a white blood cell count of 6-7/mm^3, and a glucose of too low to comment. The CSF analysis was negative for viral and bacterial meningitis including syphilis. Magnetic resonance imaging (MRI) of the brain revealed mucosal thickening in the bilateral maxillary, ethmoid, and left frontal sinuses. Nerve conduction studies revealed reduced compound muscle action potential and distal latency with normal conduction velocity in the right median, right ulnar, and right peroneal nerves. The compound muscle action potential is reduced with normal distal latency and decreased conduction velocity in the left median left ulnar and left peroneal nerves. The report con-

Table 2. Intervention during ventilator support (week 1-week 6)

Goals	Intervention
Patient education	• Caregivers and the patient were informed about the treatment being given
Improve bronchial hygiene	• Postural drainage • Manual Percussion and vibration • Suctioning
Improve lung function	• Manual hyperinflation, rib springing.
Prevent ventilator-associated infections	• Hand hygiene, daily oral hygiene, personal protective equipment for suctioning, positioning in a semi-recumbent position with the head elevated at 30°, daily cleaning of the ventilator, suction bottle with sterile distilled water, and sterilization of circuit
Chest expansion	• Intercostal stretch, co-contraction of diaphragm
Maintain and improve joint mobility	• Passive ROM exercises followed by joint compression followed by active-assisted exercises

ROM: Range of motion.

JMR

Table 3. Intervention during ward stay (week 7-week 12)

Goals	Intervention
Re-establish breathing pattern	• Diaphragmatic breathing exercise, dyspnea relieving positions
Improve muscle strength	• Strengthening program using 1 kg weight
Improve joint mobility	• Active-assisted exercises followed by active ROM exercises
Functional re-training	• Bedside sitting followed by standing to spot marching
Gait training	• Spot marching to walking with maximum support to walking with minimal support

ROM: Range of motion.

JMR

Table 4. Outcome measures indicative of patient's improvement

Scales	Week 1	Week 6	Week 12
ICU mobility scale	0 (lying on bed)	4 (standing)	8 (walking with the assistance of one person)
FIMS	Maximal assistance	Moderate assistance	Minimal assistance
HADS	Severe depression and anxiety	Moderate depression and anxiety	Moderate depression and anxiety

JMR

Abbreviations: ICU: Intensive care unit; FIMS: Functional independence measure scale; HADS: Hospital anxiety and depression scale.

cluded with evidence of sensory-motor polyneuropathy. In chest X-ray, homogenous opacity was observed in in right lower zone (Figure 1).

The primary goal of the physiotherapist was to begin the process of weaning through bronchial hygiene and spontaneous breathing trial, which was achieved by body positioning, percussion, and vibrations techniques for 10 minutes 4 hourly followed by SOS suctioning. The patient was positioned in side side-lying position every 2 hours (Figure 2). The patient was shifted to continuous positive airway pressure mode after 15 minutes of each physiotherapy session under supervision and monitoring [12] (Tables 2 and 3).

Outcome measures used included the intensive care unit (ICU) mobility scale, functional independent measure score (FIMS), and hospital anxiety and depression scale (HADS) which showed patient's improvement in the course of hospitalization (Figure 3).

Discussion

Mao et al. review concluded that COVID-19 infection causes neurological symptoms [3]. Polyneuropathy, myopathy, stroke, and GBS were among the neurological manifestations identified in other beta coronaviruses (SARS and MERS) [13]. In a review by Caress et al.,

Figure 2. Patient on T-piece receiving manual chest vibrations

JMR

Figure 3. Standing without support and walking with minimal support

JMR

the time from COVID-19 symptoms to GBS symptoms is about 11 days. Also, the symptoms of GBS after COVID is the same as non-COVID [14]. After COVID-19 infection, GBS is rare but a major complication. After reporting of first case of GBS after COVID-19 infection, it was proposed that the axonal variant is more common than the demyelinating variant [15-16]. This case shows the prolonged stay of the patient at the hospital due to COVID-19 associated with GBS. In this case, the effectiveness of pulmonary rehabilitation along with medical care is seen, which resulted in the rapid recovery of GBS patients followed by COVID-19. The patient was admitted to the ICU with complaints of weakness in the bilateral lower limb, difficulty in coughing, and generalized weakness, along with a history of COVID-19 around 6 months back. The patient was started on an intravenous immunoglobulin (IVIG) regimen with the suspicion of GBS. IVIG and or plasmapheresis are the choice of treatment for GBS patients along with supportive care depending on the cost and availability. IVIG is known as an immune-modulating drug that helps by promoting early recovery and reduced hospital stay. Besides, recovery from GBS also benefits from regular rehabilitation as it focuses on gaining mobility and strength back as the drugs run their course. The physiotherapy intervention strategy started with positioning, airway clearance, breathing retraining, limb mobility exercises, and strengthening. Walking was initiated as the patient tolerated bedside sitting. Oxygen titration was required as the patient became de-saturated after walking. Supplementary oxygen also helps in covering more distance and improves the functional capacity of the patient. As the patient got shifted in the step-down care, incentive spirometer, mobility exercises, and walking program were continued. As the treatment progressed, the patient was able to do exercises and daily activities without the need for oxygen. Over a period of 12 weeks of hospital stay, ICU mobility score, FIMS score, and HADS score were improved as shown in Table 4. Pharmacotherapy decreased the disease progression and with regular physiotherapy, the patient showed improvement in muscle strength, and the improvement was seen in the score on the ICU mobility scale. The patient was able to stand on the day of discharge from the ICU. The patient gained control and strength as the rehabilitation continued from passive range of motion to active assisted to active movements which was noted in the FIMS score. The patient was also counselled and encouraged during every treatment session in the course of 12 weeks which was noted in the HADS score.

Conclusion

The results of this study show that pulmonary rehabilitation, which includes breathing retraining, airway clearing techniques, a combination of chest PNF techniques, positioning, walking with augmented oxygen, and psychological support, was important in managing a patient with a diagnosis of post-COVID GBS. The pulmonary rehabilitation program was extremely beneficial in terms of enhancing overall functional efficiency and improving quality of life. Thus, a comprehensive pulmonary

rehabilitation program with the techniques mentioned above can be used in a post-COVID GBS patient to regain functional independence.

Ethical Considerations

Compliance with ethical guidelines

Proper informed consent was taken from the patient prior.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors' contributions

Selection and writing of the case report: Nikita Kachhwani and Pallavi Bhakaney; Critical reading and correction of the writing: Pallavi Bhakaney and Vaishnavi Yadav; Final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

References

[1] Wobeto WP, Zani BB, da Silva Esteves AB, da Silva Marangoni MV, Pinatti ND, Pedro KN, et al. Guillain-barre syndrome: Case study and literature review. Immunome Research. 2019; 15(3):1-4. [Link]

[2] Zade R, Sahu P, Shende G, Phansopkar P, Dadgal R. Comprehensive physical therapy improves functional recovery in a rare case of stroke associated with asthma: A case report. Medical Science. 2020; 24(105):2893-9. [Link]

[3] Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, et al. Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. JAMA Neurol. 2020; 77(6):683-90. [PMID]

[4] Zubair AS, McAlpine LS, Gardin T, Farhadian S, Kuruvilla DE, Spudich S. Neuropathogenesis and neurologic manifestations of the coronaviruses in the age of coronavirus disease 2019: A review. JAMA Neurology. 2020; 77(8):1018-27. [DOI:10.1001/jamaneurol.2020.2065] [PMID] [PMCID]

[5] Sedaghat Z, Karimi N. Guillain Barre syndrome associated with COVID-19 infection: A case report. Journal of Clinical Neuroscience. 2020; 76:233-5. [DOI:10.1016/j.jocn.2020.04.062] [PMID] [PMCID]

[6] Camdessanche JP, Morel J, Pozzetto B, Paul S, Tholance Y, Botelho-Nevers E. COVID-19 may induce Guillain-Barré syndrome. Revue Neurologique. 2020; 176(6):516-8. [DOI:10.1016/j.neurol.2020.04.003] [PMID] [PMCID]

[7] Živković V, Gačić EM, Djukić D, Nikolić S. Guillain-barré syndrome as a fatal complication of SARS-CoV-2 infection-An autopsy case. Legal Medicine. 2022; 57:102074. [DOI:10.1016/j.legalmed.2022.102074] [PMID] [PMCID]

[8] Montalvan V, Lee J, Bueso T, De Toledo J, Rivas K. Neurological manifestations of COVID-19 and other coronavirus infections: A systematic review. Clinical Neurology and Neurosurgery. 2020; 194:105921. [DOI:10.1016/j.clineuro.2020.105921] [PMID] [PMCID]

[9] Xie Z, Hui H, Zhao Z, Yu W, Wu R, Zhu Y, et al. Nervous system manifestations related to COVID-19 and their possible mechanisms. Brain Research Bulletin. 2022; 187:63-74. [DOI:10.1016/j.brainresbull.2022.06.014] [PMID] [PMCID]

[10] Shamsi S, Mugheeb T, Khan S. Physiotherapy Management of COVID-19. International Journal of Science and Healthcare Research. 2020; 5(3):108-16. [Link]

[11] Leonhard SE, Mandarakas MR, Gondim FAA, Bateman K, Ferreira MLB, Cornblath DR, et al. Diagnosis and management of Guillain-Barré syndrome in ten steps. Nature Reviews. 2019; 15(11):671-83. [DOI:10.1038/s41582-019-0250-9] [PMID] [PMCID]

[12] Demeco A, Marotta N, Barletta M, Pino I, Marinaro C, Petraroli A, et al. Rehabilitation of patients post-COVID-19 infection: A literature review. The Journal of International Medical Research. 2020; 48(8):300060520948382. [DOI:10.1177/0300060520948382] [PMID] [PMCID]

[13] Bawiskar D, Phansopkar P, Gotmare AV. COVID-19 facets: Pandemics, curse and humanity. International Journal of Research in Pharmaceutical Sciences. 2020; 11(SPL1):385-90. [DOI:10.26452/ijrps.v11iSPL1.2731]

[14] Bawiskar D, Dhote S, Phansopkar P. Early physical rehabilitation post-surgery in a complex type 5 schatzker tibial plateau fracture improves functional outcomes: A case report. Medical Science. 2020; 24(104):2675-82. [Link]

[15] Caress JB, Castoro RJ, Simmons Z, Scelsa SN, Lewis RA, Ahlawat A, et al. COVID-19-associated Guillain-Barré syndrome: The early pandemic experience. Muscle & Nerve. 2020; 62(4):485-91. [DOI:10.1002/mus.27024] [PMID] [PMCID]

[16] Ramani SL, Samet J, Franz CK, Hsieh C, Nguyen CV, Horbinski C, et al. Musculoskeletal involvement of COVID-19: Review of imaging. Skeletal Radiology. 2021; 50(9):1763-73. [DOI:10.1007/s00256-021-03734-7] [PMID] [PMCID]