Capter 181

Effects of a protocol for respiratory muscle training and balance in Guillain-Barré Syndrome: case report

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ABSTRACT
Guillain-Barré Syndrome (GBS) is an inflammatory polyneuropathy, characterized by ascending demyelination of peripheral and cranial nerves. Respiratory and balance deficits and functional incapacity are expected limitations in these individuals. This study aimed to verify the effects of a respiratory and balance muscle training protocol in an individual with SBG. For this purpose, the following research instruments were used: Spirometry, Manovacuometry, Peak Expiratory Flow, Berg Balance Scale (BBS), and Functional Independence Measure (FIM). The respiratory training protocol was performed using Threshold IMT (30 – 50% MIP) and Threshold PEP (30% MEP). Balance training was divided into 3 phases, with progressive exercises and loads. Both protocols lasted four months, with three weekly interventions. As a result, it was observed that in the initial evaluation, there was inspiratory and expiratory weakness. After four months of intervention, MIP remained at the same value and MEP had an increase of 12.8% beyond the predicted value. Regarding the peak expiratory flow, in the evaluation, it was obtained at 75.31%, and in the reassessment 80.25% of the predicted value. Regarding the BBS in the evaluation, 50% of the total score was reached, and in the reevaluation, 89.28%. In the FIM assessment, initially 113 points, and in the reassessment 122 points. It is concluded that there was an improvement in the respiratory parameters, balance, and functional independence of the volunteer in this study, diagnosed with GBS.

Keywords: Respiratory physiotherapy, Berg Balance Scale, Functional Independence Measure.

1 INTRODUCTION

According to Hirata and Marchiori (2009), Guillain-Barré syndrome (GBS) is clinically characterized by a progressive motor deficit, generally ascending, of acute onset accompanied by areflexia, with or without sensory alteration, with early and spontaneous recovery. Based on pathological and electroneurophysiological studies, GBS can be divided into predominantly demyelinating or axonal forms. Currently, under the name GBS, different forms of the disease are included, with the predominant motor deficit: Acute inflammatory demyelinating polyradiculoneuritis (AIDP); Acute sensory-motor axonal neuropathy (AMSAN); Acute axonal motor neuropathy (AMAN). And in addition to these forms, other variants with another predominant clinical picture are described: Miller-Fisher syndrome; Acute pandysautonomic neuropathy (HIRATA; MARCHIORI, 2009).

GBS is the most frequent cause of the generalized weakness of non-traumatic acute onset, with an annual incidence of 1 to 2 in 100,000 inhabitants. It can occur in all age groups, with an average age of 40 years. Some epidemiological studies have suggested a peak in young adults and a second smaller peak between the fifth and seventh decades of life, with a slight predominance of males over females (HIRATA; MARCHIORI, 2009).

Respiratory physiotherapy can act both in the prevention and treatment of respiratory diseases using various techniques and therapeutic procedures. Its objectives are to establish or re-establish a functional breathing pattern, aiming to reduce energy expenditure during ventilation and enabling the individual to perform the most different basic activities of daily living, without promoting major disorders and negative repercussions on his body (AZEREDO et al., 1993).

To keep itself in balance, the body depends on the coordinated action of the CNS, which is capable of generating muscular responses to regulate the center of mass over the body's support base. This process depends on a complex relationship between the motor and sensory systems, and when this does not occur properly or when there is a malfunction in this system, postural instability is triggered and, therefore, imbalance (FREITAS; BARELA, 2006).

We can define functional incapacity as the inability or difficulty to carry out tasks that are part of the human being's daily life and that are normally indispensable for an independent life in the community. According to Terroni et al. (2003), neurological damage can significantly limit an individual's functional performance, with negative consequences for family and social relationships and quality of life.

In this context, respiratory and balance deficits and, consequently, functional disability, may be expected limitations in individuals diagnosed with GBS. For these reasons, the present study aimed to verify the effects of a respiratory training protocol on respiratory muscle strength, as well as the effects of a balanced protocol on the functional independence and balance of an individual with SBG.

2 MATERIALS AND METHODS

An exploratory-descriptive, longitudinal-prospective, quantitative study, developed at the URI Physiotherapy School Clinic - Erechim Campus, which was approved by the Research Ethics Committee of the Integrated Regional University of Alto Uruguai e das Missões, according to CAEE: 96953018.9.0000.5351.

The sample was intentional and composed of a female individual, diagnosed with Guillain-Barré Syndrome, identified through the registration of the Clínica Escola de Fisioterapia da URI – Erechim, who was not undergoing physical therapy treatment at the time of the invitation, non-smoker. and with no obstructive ventilatory disorder.

The evaluation protocol initially included anamnesis, followed by the Spirometry test, performed for diagnostic purposes, aiming to exclude obstructive ventilatory disorder. The Peak Expiratory Flow was performed to verify the amount of expired air, using the portable flow meter from the Peak Flow Meter®

brand. The protocol followed for carrying out the testing followed that recommended by Pereira and Moreira (2002). This test was performed previously (before) and after the end of the physiotherapeutic interventions. Manovacuometry was performed to assess respiratory muscle strength: maximum inspiratory pressure (MIP) based on Functional Residual Capacity (FRC) and maximum expiratory pressure (MEP) based on Total Pulmonary Capacity (TLC). For this purpose, a portable MVD300 digital Manovacuometer, GlobalMed brand, was used, following the recommended protocol and comparing the results with the values predicted by Neder et al., 1999. This testing took place previously (before) and after the end of the physiotherapeutic interventions.

To assess static and dynamic balance, as well as the risk of falls, the Berg Balance Scale was applied. The BBS is a validated functional balance assessment instrument, consisting of 14 tasks with five items each and a score of 0 - 4 for each task: 0 - is unable to perform the task and 4 - performs the task independently. The total score ranges from 0 - 56 points, the lower the score, the greater the risk for falls; the higher, the better the performance (GAZZOLA et al., 2006; CHRISTOFOLETT et al., 2006).

To assess functional independence, the Functional Disability Measure (FIM) was used as an instrument. This is an instrument for assessing the disability of patients with functional restrictions of various origins and comprises 18 items. Among the activities evaluated are transfers, self-care, locomotion, sphincter control, communication, and social cognition, including memory, social interaction, and problem-solving. Each of these activities is evaluated and receives a score ranging from 1 (total dependence) to 7 (complete independence), thus the total score ranges from 18 to 126 (RIBERTO et al., 2000).

The physiotherapeutic intervention protocol was performed 3 times a week, lasting approximately 50 minutes each, for 4 months, totaling 44 interventions.

The respiratory muscle training protocol was based on increasing a linear pressure load to improve the strength of both the inspiratory and expiratory muscles (Threshold IMT® and Threshold PEP®, both from Respironics). Inspiratory muscle training ((Threshold IMT®) was performed with an initial pressure (load) of 30% from MIP (12cmH2O) in the 1st week, 40% (16cmH2O) in the 2nd and 3rd weeks, and 50% (20cmH2O) of 4th to 12th week. The volunteer remained in a sitting position, and the researcher sat in front of her holding the device. A nose clip was used to prevent air leakage so that breathing was carried out only through the mouth. Therefore, the command to carry out inspiration (nozzle) against the resistance imposed by the "spring load" resistor, and then recommend a normal expiration.6 series of 10 repetitions were performed, with an interval of approximately 40" between each series.

Expiratory muscle training (Threshold PEP®) was performed with an initial load of 30% from MEP (19.5cmH2O) and in the remaining weeks, the maximum load allowed by the device (20cmH2O) was used. After preparation, the command was given for the individual to inhale and exhale against the resistance imposed by the EPR of the device in the expiratory phase. Six series of 10 repetitions were performed, with an interval of approximately 40" between each series.

The balance protocol was carried out immediately after the end of the respiratory training in each session, consisting of kinesiotherapeutic exercises, initiated by stretching the lower limbs, upper limbs, and trunk, each stretching being maintained for 30", which remained the same in all sessions. interventions. Afterward, the balance protocol was divided into three phases, that is, phase 1 (for 2 weeks); phase 2 (5 weeks), and phase 3 (5 weeks), consisting of progressive muscle strengthening, proprioceptive, balance, and gait training exercises.

3 DATA ANALYSIS

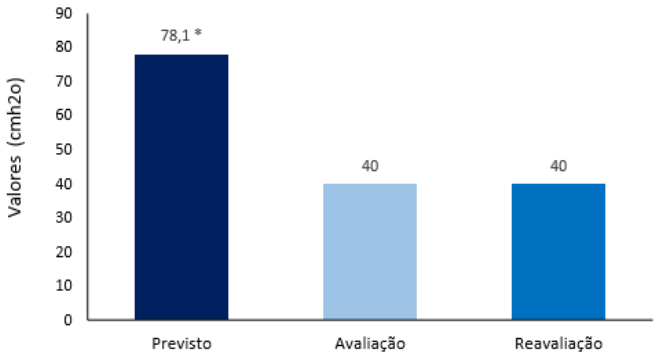
Data analysis was performed using simple descriptive statistics.

4 RESULTS AND DISCUSSION

Female, 66 years old, height 1.64 cm, 62 kg, electroneuromyography compatible with motor electrophysiological sequelae of Guillain-Barré Syndrome that occurred in 2015 (probable motor axonal variant - AMAN). Non-smoker, with no obstructive ventilatory disease measured by spirometry, but with reduced intermediate forced expiratory flow FEF 25-75% 49/100%, demonstrating obstruction of the peripheral airways.

Regarding respiratory muscle strength, weakness in the inspiratory and expiratory muscles was observed in the initial assessment, which reached a value of - 40 cmH2O (51.2% of the predicted value) of MIP, and 65 cmH2O (86.3% of the value predicted) MEP After respiratory muscle training, it was found that the MIP value remained the same (- 40 cmH2O), as shown in Figure 1, and the MEP changed to (85 cmH2O), showing an increase of 12.8%, as shown in Figure 2.

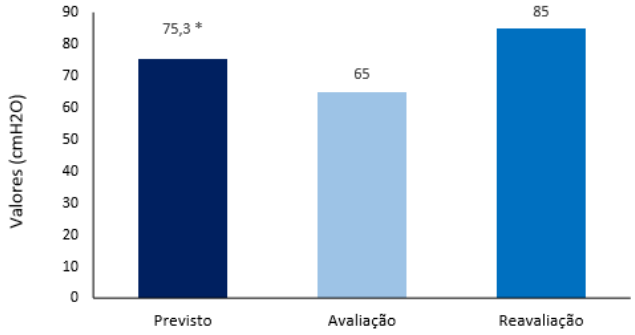
Figure 1 – Maximum Inspiratory Pressure Values (PImax)



Source: Study data (2019), *NEDER and collaborators (1999).

Subtitle: Foreseen
Assessment
Revaluation

Figure 2 –. Maximum Expiratory Pressure Values (MEP)



Source: Study data (2019), *NEDER and collaborators (1999).

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Due to the scarce literature on the respiratory investigation in GBS, we opted for the discussion based on different neurological pathologies, which present progressive loss of respiratory muscle strength.

Smeltzer et al. (1996), carried out a study with 15 patients with Multiple Sclerosis (MS), intending to strengthen the respiratory muscles daily, 3 series of 15 repetitions for 12 weeks with (threshold PEP® 10% of MEP), and a significant increase in MEP was observed (45.6/74.6% respectively).

Gosselink et al. (2000) carried out a study with 18 patients with MS, where they evaluated the relationship between respiratory muscle strength and health status 7 days/week, 2 daily sessions, for 3 months. Interventions in the training group were performed with Threshold PEP® with a load of 60% of MEP (3 sets of 15 repetitions). After the interventions, there was an improvement in the maximum respiratory pressures in the group that underwent respiratory training, but the results were not significant. This study demonstrated the importance of training the expiratory muscles with higher loads. In our study, training was performed with 30% of MEP and there was an increase in strength after the intervention.

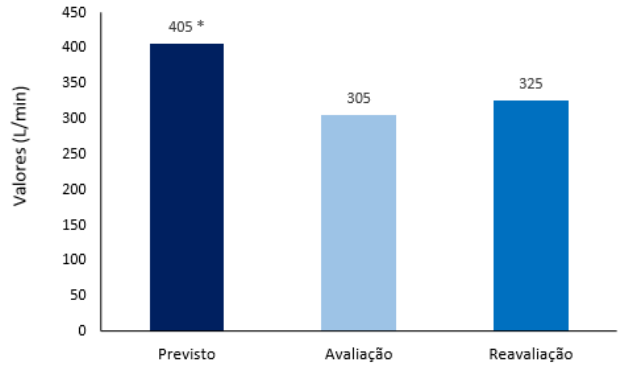
Likewise, studies carried out by Klefbeck and Nedjad (2003), with 7 patients with MS, but in protocols with 2 sessions/day and 3 series of 10 inspirations for 10 weeks with Threshold IMT® (40 - 60% of MIP), an increase in post-training MIP was verified, with a significant difference between the training group (TG) (pre-intervention MIP: 42 and post-intervention: 67 with $p < 0.008$) and the control group (CG) (pre-intervention MIP: 52 and post-intervention: 54).

Fregonezi et al., in 2015, evaluated muscle impairment in diseases in a group of healthy individuals and those with neuromuscular diseases (NMDs), Myotonic Dystonia (DM), Myatenia Gravis (MG) and Amyotrophic Lateral Sclerosis (ALS). And they found that healthy individuals had normal values (MIP/MEP), however, individuals with NMDs had values below normality. Demonstrating an impairment of respiratory muscle strength.

Regarding the peak expiratory flow, the results showed a decrease in the expiratory flow in the initial assessment of 305 L/min (75.31% of the predicted value), and the predicted value would be 405 L/min, according to values predicted by Leiner et al. (1963) and in the reassessment, the patient presented

325L/min. (80.25% of the predicted value), presented 20 L/min (4.94% more) at peak expiratory flow as shown (Figure 3).

Figure 3 - Peak expiratory flow values.



Source: Study data (2019), *NEDER and collaborators (1999).

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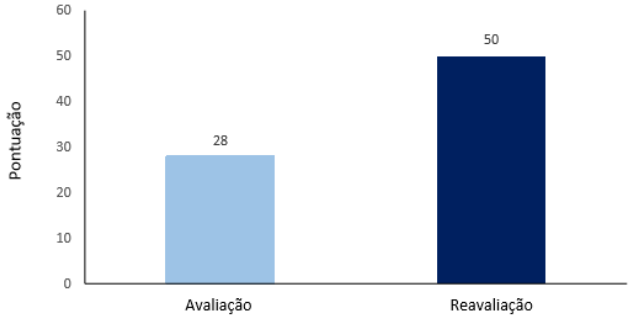
Aiello et al. (2008) evaluated the cough of patients with MS, by measuring the peak expiratory flow (PEF), and found a slight impairment in these patients. Furthermore, this study provided the first scientific evidence that PEF is related to the disability of patients with MS, that is, in these patients, low PEF values are associated with high values on the Kurtzke Expanded Disability Status Scale (EDSS), which means worsening of the patient's clinical condition.

Chiara et al. (2006) conducted a study with 17 patients with MS to evaluate the effects of expiratory muscle training with Threshold® PEP, 5 days/week for 8 weeks and found a significant increase in MEP and PEF (pre-training for post-training: MEP, F=95.01, P<0.000; PEF, F=8.03, P<0.006) respectively.

Regarding the results of the balance assessment using the BBS, there was a low score at the time of the assessment (50% of the total score), which demonstrates a high risk of falls, as well as a moderate to severe balance deficit. In the reassessment, 89.28% was reached under the total scale score, demonstrating an increase of 39.28% in the BBS score after performing the balance protocol (Figure 4).

Figure 4 – Berg balances scale values, before and after the balance protocol.



Source: Study data, 2019.

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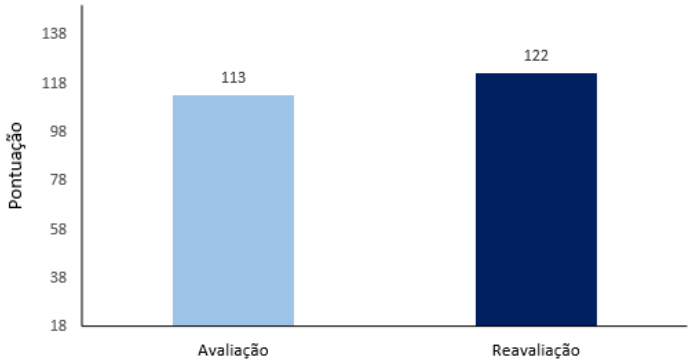
Almeida et al. (2017) carried out a study to evaluate the efficiency of balance training in 10 individuals with Multiple Sclerosis, divided into a training group (5) and a control group (5), using the BBS as a balance assessment parameter. The results demonstrate an improvement in both groups comparing pre and post-intervention: in the training group, the mean was 44.20 (±10.47) to 51.20 (±4.44), and in the control group 30.60 (±18.15) to 39.40 (±13.59).

Rodrigues et al. (2008) carried out a study that evaluated the effectiveness of physiotherapy on balance (BBS) and quality of life in patients with MS. The protocol had 20 individuals, G1: intervention group (10) and G2: control group (10), the training of the intervention group was carried out on a trampoline, imbalance boards, gait training on the parallel bar, circuits, ramp, stairs, unilateral and bilateral exercises, with and without load, and Frenkel exercises. The comparison of the average of Berg's balance, in Group 1, before the intervention was 46.6±11.6, and after it was 48.2±10.3, which showed a statistically significant improvement (p=0.011). In the control group, there was no significant improvement: 33.5 before and 33.7 after the intervention (p=0.591).

The protocol used by Rodrigues et al. (2008) follows the same line of balance exercises used in our study, except for Frenkel's exercises. In addition to these, in our study, exercises were performed with the visual field occluded, and exercises were performed in different proprioceptive bases. It should be noted that the volunteer participating in our study initially presented a more severe balance deficit (28) when compared to the sample studied by Rodrigues et al., (2008) and in the end reached a higher score (50), which demonstrates the effectiveness of the protocol used.

Regarding the results of the evaluation of the functional independence measure, at the time of the evaluation, 89.68% of the total score was reached and 96.82% in the physiotherapeutic reassessment, noting an increase of 7.14% in the total score of the functional assessment measure after performing the balance protocol (Figure 5).

Figure 5 – Values of the functional independence assessment measure.



Source: Study data, 2019.

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Carvalho and Lopes (2013) carried out a study with an individual with GBS, whose physiotherapeutic intervention was based on the promotion of independence focused on functional skills, such as restoration of muscle strength and proprioceptive quality, mainly of the lower limbs, which took place from transfer and balance training in increasingly higher and more unstable postures, gradual resistance exercises, among others. To quantify the results obtained and compare the before and after, the functional independence measure (FIM) was applied, dating an initial score of 60 points and a final reassessment of 125 points, demonstrating the gain of total independence.

Medeiros and Silva (2014) when conducting an observational study, reported that in cases of patients with GBS, FIM remains at higher values, as it is a disease of motor alterations, that is, the score of the cognitive part is always total, which corroborates the results found in our study. So, the MIF variation between the start and end is of greater value, as it only indicates motor gains. The patients evaluated in the study by Medeiros e Silva had an increase in FIM from 75.2 to 109.1, with 9 having values between 120 and 126 and of these 4 obtained the maximum value, showing that they were discharged with complete functional independence.

5 CONCLUSION

There was an improvement in respiratory parameters, expiratory muscle strength, and peak expiratory flow, as well as in the balance and functional independence of the volunteer in this study. The results allow accepting the positive hypothesis of the study, inferring that the respiratory muscle training promoted a gain in expiratory muscle strength, as well as the balance protocol contributed to the functional independence and balance of the volunteer with Guiliain-Barré Syndrome. As a limiting factor, the scarcity of publications focused on the objectives dated by our study stands out. And given the results obtained, the continuity of studies on this theme becomes relevant.

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