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Original article

THE EFFECTIVENESS OF A PHYSICAL THERAPY INTERVENTION IN A PATIENT WITH MULTIPLE SCLEROSIS ASSOCIATED WITH LYME DISEASE. A CASE STUDY

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Abstract

Objective. The goal was to highlight the importance of a physical therapy intervention in maintaining the functional independence in a patient with multiple sclerosis associated with Lyme disease by using proprioceptive neuromuscular facilitation techniques and other treatment methods. The effects caused by this disease are inflammation and demyelination, resulting in lesions of the white matter in the central nervous system. This study has observed an injury in the motor and sensory function that had a progressive form toward worsening. The study started by identifying the functional deficit, then by establishing a physical therapy intervention strategy, aiming to improve the patient's state and to maintain the subject's functionality for as long as possible.

Research methods. The frequency of the meetings with the subject was 3 sessions per week, 50 minutes each session, over the course of 9 months. The main research methods used were the observation, the exploration and assessment, the experimental method and the graphical representation method. The results were centralized in tables and represented as charts, in order to make it easier to highlight and interpret them.

Results. The interpretation of the results recorded during the initial and final evaluations of the subject has highlighted that the use of proprioceptive neuromuscular facilitation techniques and of other methods, such as massage and stretching, has led to effective results, such as the relaxation of hypertone muscles, the increase of joint mobility, muscle strengthening, correction of bad postures, increase of coordination and balance.

Conclusions. It has been observed that by applying constantly the methods and techniques used for these symptoms there was a slowing down of the progress of the disease on a long-term basis. This was obvious after the application of the initial and final tests, which showed a favorable progress in maintaining the analytical and global functionality.

Key Words: multiple sclerosis, Lyme disease, facilitation.

Introduction

Multiple sclerosis is the most frequently encountered neurological disorder in young adults that causes major invalidities, at least in European and North American countries. In Romania it is estimated that this disorder has a prevalence of approximately 35-40 in 100000 people, as shown in a series of epidemiological evaluations conducted in the eighties whose last systematic analysis was made over 10 years ago by Prof. Dr. I. Stamatoiu et al.

It is a disease that is encountered in young women (20-40 years old) two-three times more often than in men. Geographically, it predominates in the northern regions, with a prevalence of 1 in 100000 people in the equatorial areas, and of 80 in 100000 people in the north of Europe and of North America.

Researchers at the Medical Research Council Centre for Regenerative Medicine of the University of Edinburgh started from the idea that current treatment for multiple sclerosis works by reducing the demyelination, but there are no treatments that would allow the regeneration of the damaged myelin. Demyelination can occur in the early stages of the sclerosis, being caused by the death of oligodendrocytes (cells that produce myelin). Once the disease progresses, the remyelination fails. This failure leads to the neurons being affected and to the appearance of symptoms that are specific to multiple sclerosis.

The study shows that the immune cells, called macrophages (the immune system cells prove that are capable of ingesting bacterias and cellular debris before destroying them), help start the regeneration process of the myelin. Scientists have discovered that following the loss or affection of the myelin sheath, the macrophages can release a compound called

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Activin-A that activates the myelin production of oligodendrocytes. In the same way, if the production of Activin A is blocked, the activity of oligodendrocytes (cells that produce myelin) is blocked, thus the remyelination is no longer possible.
In future studies, scientists will focus on this compound, Activin A, to observe how it works and if its effects can be improved. Another possible development of this research would be the development of a drug that would mime the action of Activin A and restore the lost functions in multiple sclerosis patients.
The expectations for this research to have a major impact are great, because Activin A is a natural compound that appears as a response of the body fighting multiple sclerosis. A distinction must be made between curing and improving, because Activin A does not act on the causes of the disease but only on its effects.
Researches resulted in the creation of an element that, tested on mice, stimulated the reconstruction of the myelin sheath covering the neuron axons. This discovery could be an essential step in creating a treatment that would fight disorders such as multiple sclerosis, according to Technologynetworks.com.

Methods

The research was performed on one subject, a male patient with the clinical diagnosis of multiple sclerosis as a progressive form associated to Lyme disease. The study was conducted at the patient's home, and for the rehabilitation the author used various objects, such as two crutches, a gym ball, elastic bands, dumbbells of various weight (kg), a ball and a working table.

The frequency of the meetings with the patient was 3 sessions per week, 50 minutes /session, over the course of 9 months. The treatment sessions comprised proprioceptive neuromuscular facilitation (PNF) techniques, passive and active range of motion, resistance exercises, stretching, massage.

A somatoscopic assessment of the subject was performed in order to measure as accurately as possible the physical therapy intervention for the multiple sclerosis through the following stages:

1) **The joint testing** that measured the range of motion in the lower limbs during all the coxofemoral, knee and ankle joint movements. During the initial evaluation of the subject, the following mobility deficits were identified: hip extension 10°; hip abduction 20°; hip adduction 10°; knee extension 100°; ankle plantar flexion 35°.

2) **The muscle testing** allowed the evaluation of muscle strength, using the six-step assessment scale (0-5). The test was applied to the lower limbs under various conditions in order to observe the muscle strength in that segment of the body.

3) **The functional tests** used to assess the subject were as follows:

Pain assessment: was performed using the Visual Analogue Scale (VAS), to determine the intensity of muscle pain in the lower limbs. During the initial testing, the subject did not register any values that would indicate pain.

The Expanded Disability Status Scale (EDSS), which identifies a disability on a scale from 0 to 10.

The Ashworth scale tests the muscle spasticity.

The Tinetti balance test assesses the balance of a subject while sitting, standing, and walking.

The Barthel incapacity scale highlighted the subject's performance during ten daily life activities.

Following the somatoscopic examination, the functional diagnosis was established, and based on that, the objectives, methods and means of the physical therapy intervention were set.

Summary

What follows are the physical therapy objectives and means used in the rehabilitation program chosen in accordance with the functional deficit of the subject.

1) Relaxing the spastic muscles: the relaxing massage of the lower limbs using procedures such as the effleurage (alternating, deep tissue), light pressures, tapping, vibrations, axis tractions of the segments. For this purpose, also, proprioceptive neuromuscular facilitation (PNF) techniques were used, such as rhythmic initiation (RI) and rhythmic rotations (RR).

2) Preventing the contractions and retractions: Passive and active range of motion was included, combined with stretching, to prevent contractions and retractions, increase range of motion and muscle elasticity. Mobilizations were performed in all directions.

3) Improving the joint mobility and strengthening the muscles: exercises to increase mobility and muscle strengthening in the lower limbs applying resistance to certain motions, PNF techniques, and exercises using various objects.

4) Correcting the bad positions: The position of the lower limbs was observed during rest and during motion, constantly correcting the positions caused by the muscle imbalances.

5) Improving the stability: For this, the PNF technique alternating isometrics was used, using short and alternating isometric contractions, on the agonist and antagonist muscles, aiming to strengthen the muscles, and improve the stability and coordination. The author chose to use the PNF techniques rhythmic

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stabilization (RS) in all-fours, and resisted progression. These techniques aimed to train the patient for a reeducation of his walk. The reeducation started with a passing from sitting to assisted standing, lateral walking, back and forth walking, walking up and down the stairs.

5) Increasing the coordination: by including in the program of specific exercises, working analytically and as a whole.

6) Reeducating the walk: For this, the author used an obstacle course that aimed to highlight the patient's coordination and dynamic equilibrium. The course comprised actions such as going up and down, walking over obstacles, rolling the ball back and forth, various types and directions of walking. During the performance of the course, the therapist constantly made sure that the patient didn't fall.

Results

In regards to joint mobility in the lower limbs, there was a testing at the beginning and at the end of the study. The values included in table 1 show an improvement in the joint mobility at the end in the lower limbs in all directions of motion that were specific to the tested limbs.

Table 1. Initial and final values for joint mobility in the lower limbs

MOTION	INITIAL T.	FINAL T.
Hip flexion	110º	110º
Hip extension	10º	25º
Hip abduction	20º	35º
Hip adduction	10º	25º
Hip external rotation	30º	40º
Hip internal rotation	35º	15º
Knee flexion	135º	140º
Knee extension	100º	135º
Ankle dorsal flexion	20º	20º
Ankle plantar flexion	35º	45º

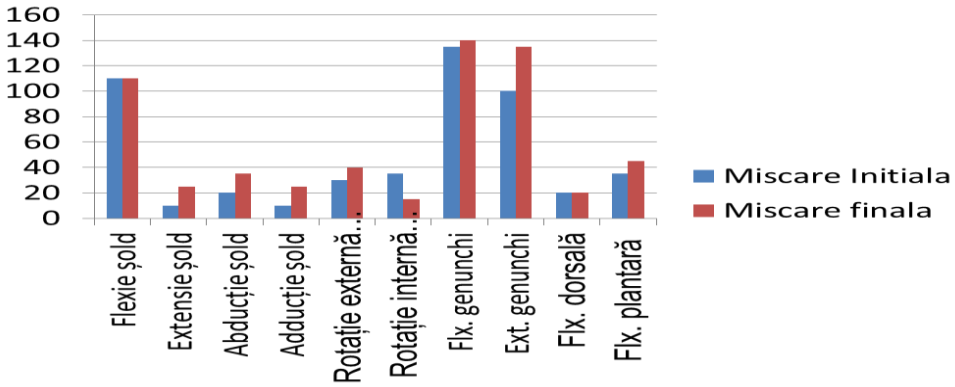

Figure 1. Initial and final values for joint mobility in the lower limbs

Table 2 shows that for the hip flexion/extension, knee flexion and plantar flexion motions the subject recorded the highest values in regards to muscle strength.

Table 2. Initial and final values for muscle strength in the lower limbs

MOTION	INITIAL T.	FINAL T.
Hip flexion	F3	F3+
Hip extension	F2+	F3+
Hip abduction	F2+	F3
Hip adduction	F2+	F2+
Hip external rotation	F2+	F2+
Hip internal rotation	F2+	F2+

Knee flexion	F3	F3+
Knee extension	F2	F2+
Ankle dorsal flexion	F2	F2
Ankle plantar flexion	F3	F3+

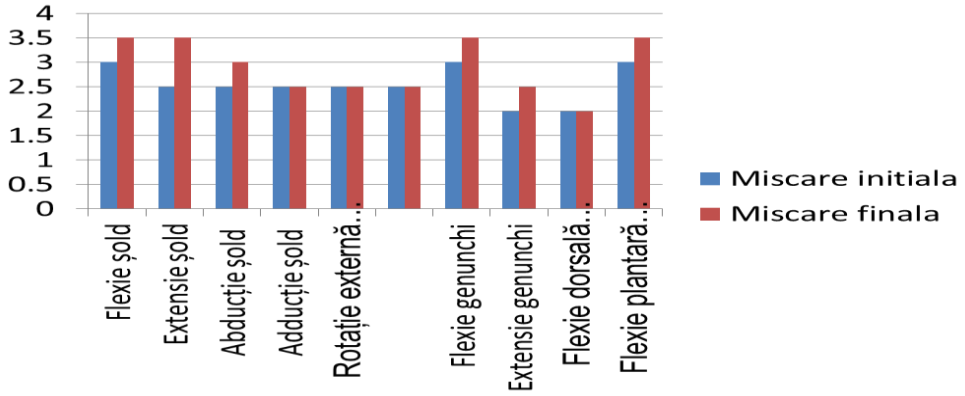

Figure 2. Initial and final values for muscle strength in the lower limbs

Table 3. Tinetti balance test

Initial testing		**Final testing**
POINTS	6	11

The Tinetti test was used to assess balance while sitting, standing, and walking.

Table 3 shows that during the initial testing the subject recorded a total score of 6 points, this pointing out his functional deficit, while during the final testing the subject recorded a score of 11 points out of 16, this marking his progress.

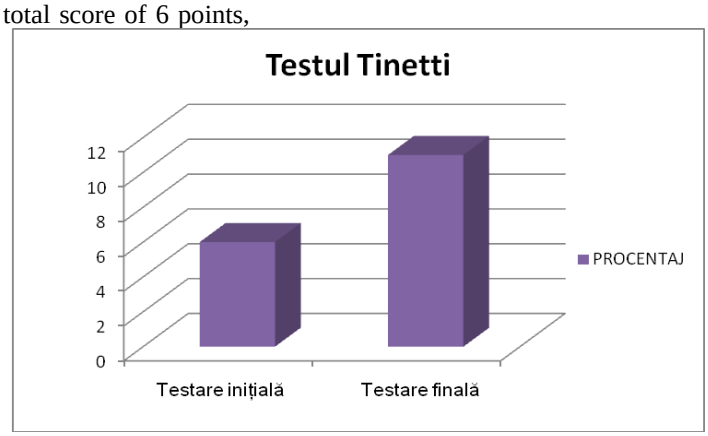

Figure 3. Initial and final values for the Tinetti balance test

Table 4. Barthel incapacity scale

BARTHEL SCALE	**Initial testing**	**Final testing**

POINTS	60	75

The subject's performances were observed during ten daily life activities using the Barthel scale. Those activities were: feeding himself, bathroom habits, grooming, dressing, intestinal control, bladder control, toilet negotiation, bed negotiation, walking, negotiating stairs.

Table 4 shows that during the initial testing the subject recorded a score of 60 points, pointing out the subject's low capacity for performing activities, while during the final testing, the subject recorded a sore of 75 points out of 100, marking his progress.

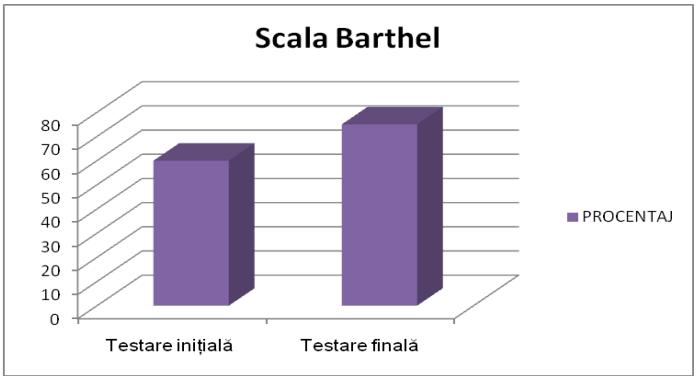

Figure 4. Barthel scale results

The subject's muscle spasticity was assessed using the Ashworth scale, with its six steps.

The subject's functional deficit is caused by a spasticity of 1-2 in the following muscles: hamstrings, with a score of 1, maintained from the initial to the final testing; adductor muscles, with an initial score of 2 and a final score of 1; plantar flexor muscles, with a persistent score of 1.

Table 5. Ashworth scale results

Tested muscles	Initial testing	Final testing
Hamstrings	1	1
Inferior adductor m.	2	1
Plantar flexor muscles	1	1

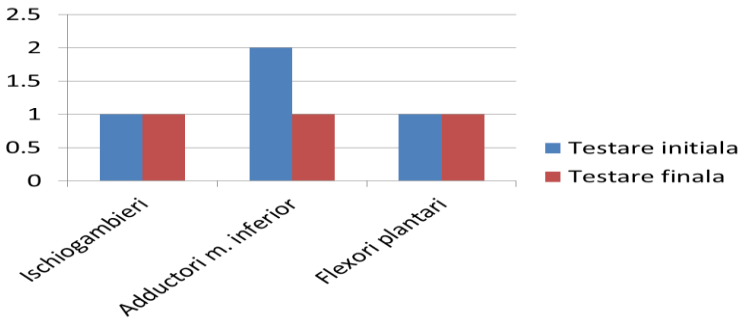

Figure 5**.** Ashworth scale

The EDSS testing identified one disability, of 6, according to which the subject presents a walking dysfunction that requires a cane or crutches. This value was maintained from the initial to the final testing.

Figure 6. EDSS results

Conclusions

The physical therapy program consisting of specific and carefully selected methods and techniques has contributed to reaching the goals set at the beginning of the study that envisaged the improvement of certain parameters and maintaining the functionality of the subject.

The use of proprioceptive neuromuscular facilitation techniques combined with relaxing massage determined a relaxation of the shortened muscles and a stimulation of the elongated and hypotonic muscles, which contributed to the effective correction of muscle imbalances.

The application of techniques involving isometrics led to an increase in joint mobility and muscle strength in the injured area, with positive long-term effects.

The therapy program contained obstacle courses that aimed to highlight the increase in the subject's coordination, static and dynamic equilibrium.

At the end, it can be said that through a constant application of the physical therapy program that was tailored for this specific problem, the long-term progress of the disease can be relatively slowed down, according to the frequency of the sessions and the patient's cooperation in maintaining the acquired functionality. This was highlighted through the graphical representation of the values recorded during the initial and final tests, which indicate a favorable progress in maintaining the overall functionality.

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