

# Physiotherapy in a Patient with Neuromyotonia - Case Report

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## Abstract

**Background and purpose:** Neuromyotonia (NMT) is a rare condition that affects peripheral nerves, characterized by spontaneous, continuous muscle activity resulting in visible myokymia, cramps and impaired muscle relaxation. The purpose of this study was to show effects of a non-pharmacological approach on function, symptoms and quality of life in one case with this syndrome.

**Case description:** A 63 years-old male independent and autonomous complaints about cramps and muscle fatigue when doing activities like walking. The symptoms appeared one year prior to the first day he started the intervention in this study. He had visible bilateral hypertrophy of calf muscles.

**Intervention:** The patient had sessions of physical therapy 2 d/wk. for 8 weeks. Each session lasted about 35 minutes, and included 10 minutes of local heat, 7.5 minutes of massage on each calf muscle and 3x30 seconds of calf stretching in each leg, with a period of rest of 30 seconds. The 6-Minute Walk Test (6MWT) was used to measure function and the Modified Borg Scale for Perceived Dyspnea was used to measure general level of fatigue. To measure cramps and hours of sleep two questions were asked and the Portuguese Short Form-12v2 Health Survey questionnaire to determine the quality of life. Outcomes were assessed at baseline and at 1, 2 and 3 months after intervention started.

**Results:** The participant demonstrated improvements in the 6MWT and in cramps frequency.

**Discussion:** Outcomes suggest that a physical therapy program may help in improving function and reducing cramps frequency on individuals with Neuromyotonia.

## Keywords

Neuromyotonia; Physical Therapy

## Introduction

Neuromyotonia (NMT) is a rare condition that affects the peripheral nerves, characterized by spontaneous, continuous muscle activity resulting in visible myokymia (muscle twitching at rest), cramps and impaired muscle relaxation (pseudomyotonia) [1]. The constant-firing motor units in NMT can be enough to cause a neuromuscular transmission effect, leading to Myasthenia Gravis [2]. Efforts to find a treatment are being made, but studies on such cases have only focus in pharmacological interventions, more specifically on immune therapy [3,4]. Although no cure exists for this disease, the long-term prognosis for individuals with this disorder is uncertain, but quality of life is reduced through time [5,6]. The purpose of this study is to show effects of a non-pharmacological approach on functionality and quality of life in one case with this syndrome.

## Case Description

This study was conducted in the Clinic Pedagogical of the Health School Dr. Lopes Dias, at Castelo Branco, Portugal. An informed consent was obtained from the patient.

## History

A 63 years-old male came to our Clinic Pedagogic to do physical therapy sessions. He's retired but very independent, autonomous, alert and cheerful, with complaints about some cramps and mainly for muscle fatigue when doing activities like walking

100 meters. The symptoms began one year prior to the first day he started the intervention in this study. At first, doctors thought it was lateral sclerosis amyotrophic, but electrophysiological studies and immunological findings confirmed the presence of NMT. He states that he became much more sedentary from the point he found out that he has a disease. He also has anemia, and has been treated for this for 9 months ago. He performed immunotherapy 7 months ago, which resulted in some relief and physical therapy sessions for 3 weeks, which stopped 2 months ago, where he states he received massage and exercise for about one hour in total spent time. No instruction to do a daily home exercise program was given. He said that physiotherapy resulted in a slight decrease of symptoms and increase in general mobility. He is not taking any medication for the auto-immune disease now.

The patient started this study when he was assessed in our Clinical Pedagogical, on the 05 October, 2010. He was asked to talk about his complaints. He said he does not sleep more than 4 hours at night and feels muscle twitching from all parts of his body (but started from hands and then feet). Muscle stiffness decreases a little when sleeps, but he always feels unwell, even when he wakes up. Now, the legs are the most important complaint to him. Palpation or manual muscle tests were not performed as they would not give important outcomes when compared to functional tests.

The patient has diabetes Mellitus and anaemia. The patient did not report any history of fever, chills, joint pain, and rash. There was no history of toxic exposures. No family history was reported either. He reported to be very sedentary now.

## Examination

At physical exam, skin, respiratory, cardiovascular, gastrointestinal, and urinary systems were normal. He had visible hypertrophy of calf muscles, in both legs. Also has very constant muscle twitching on other parts of the body, like hands, buttocks, thighs and feet.

Cramps and dyspnea are the principal symptoms in patients with NMT [4,7]. There are no specific instruments for measuring function and quality of life for patients with this pathology, so three instruments were used to measure function, general level of fatigue and quality of life. The 6-Minute Walk Test (6MWT) was used to measure function, which is valid and reliable [8], with Modified Borg Rating of Perceived Exertion (MBRPE) in the end of the 6 minutes for effort perception. The 6MWT measures the distance that an individual is able to walk over a total of six minutes on a hard, flat surface. The goal is for the individual to walk as far as possible in six minutes. The individual is allowed to self-pace and rest as needed as they traverse back and forth along a marked walkway. MBRPE is a scale rated from 0 to 10 to measure breathless. MBRPE was used to measure global level of fatigue for the perceived exertion on the last week in general and during a walk of 100 meters. Portuguese Short

Form-12v2 Health Survey (SF-12v2) questionnaire was administered to measure quality of life. The subject was asked to walk as fast as he could during the 6MWT. Two questions were also added for symptoms related to the number of cramps on the last week and average hours of sleep overnight on the last week.

All these outcomes were assessed on baseline, t1 (1 month after the intervention started), t2 (at the end of the intervention) and at t3 (1-month post-intervention).

## Intervention

The patient had sessions of physical therapy 2 d/wk. for 8 weeks. Each session lasted about 35 minutes, and included 10 minutes of humid heat, 7.5 minutes of massage (effleurage and deep muscle massage) on each calf muscle and 3x30 seconds of calf stretching on each leg, with a period of rest of 30 seconds. The aim of intervention was to relax the calf muscles and minimize the effects of hypertrophy. The humid heat was placed directly above the calf muscles and hot packs wrapped in towels were used. All 16 sessions were completed without any complication. For stretch intensity, the subject was asked to graduate, from 0 to 10, the sensation of stretching of the calf muscles performed by the force applied by the physiotherapist, so that he would say “stop” when he was in grade 7. This stretch was manually performed by the therapist through elevation of leg and dorsiflexion of the foot. Eight weeks were chosen to allow the muscle fibers some remodeling effect. The patient performed heat and the massage in ventral position and the stretches on dorsal position. No educational intervention or home tasks were given.

## Outcomes

The clinical outcomes are presented in table 1.

As it can be seen, the most visible findings were in 6MWT distance and in the number of cramps in calf muscles per week. In fact, the increase in 6MWT distance between baseline and t1 (+78.7 m), baseline and t2 (+90.4 m) and baseline and follow-up (+76.5) was greater than the minimal clinical important difference in geriatrics population [9]. The lasting effects of this intervention are an important finding of this study. It seems that General Fatigue Level of Last Week and Fatigue Level Last Week walking 100 meters slightly decrease from baseline to t2, but improvements were only modest (-1 and -2 punctuations, respectively). The patient reported also some sensation of weightlessness and more willingness to move. The intervention didn't show any improvements in quality of life, fatigue perception and average number of sleep hours.

The patient was asked to grade his level of satisfaction regarding the intervention. He reported to be satisfied with reduction in frequency cramps and the sensation of weightlessness, but it wasn't enough his perception on quality of life.

	Baseline (t0)	1-mo after Intervention Started (t1)	End Intervention (t2)	1-mo Follow-up (t3)
SF12v2				
PCS	30.9	24.9	33.1	30.9
MCS	39.1	55.6	43.3	39.1
6MWT	330 m	408.7 m	420.4 m	406.5 m
MBRPE in 6MWT	7	5	6	3
N° of Cramps per Week	2	0	0	0
N° of Sleep Hours per Day	4	3	3	2
General Fatigue Level of Last Week (MBRPE)	5	6	4	6
Fatigue Level Last Week walking 100 meters (MBRPE)	7	7	5	7

**Table 1:** Clinical outcomes

(SF12v2 - Short Form 12 version 2 Health Survey, PCS - Physical Health Composite Score, MCS- Mental Health Composite Score, 6MWT - Six Minute Walk Test, MBRPE - Modified Borg Rating of Perceived Exertion, (0 meaning no effort, 10 maximum effort)).

## Discussion

Physical therapy programs may be effective in improving function and reducing complications associated to muscle impairments in people with NMT. Recent discoveries concluded NMT can be a consequence of a mutation in HINT1 gene [10]. Management of patients living with NMT has been focused on pharmacological treatments, due to its clinical etiology [11,12]. Nevertheless, management of symptoms and improving function through non-pharmacological approach should also be studied.

Hypertrophy and fasciculation are one of the symptoms present in this case [13]. The continuous muscle activation leads to lack of muscle relaxation, triggering cramps and discomfort [4]. The majority of studies found in literature [14] use active approaches, like exercise, to reinforce muscle strength. In this study, the rationale for intervention was based on improving muscle fibers properties through the heat, massage directed to calf muscles and stretch, in an attempt to recover some mobility, flexibility and contractibility of those muscles [15]. Passive approaches were chosen to not stimulate the hyperexcitability of the peripheral nerve. Although symptoms were spread through upper and lower limbs, the patient and the physiotherapist agreed to focus on the most symptomatic muscle group to test intervention. Fatigue can also be an associated symptom caused by central nervous system or as a consequence of muscle dysfunction [3,16].

Although quality of life didn't seem to improve in this case, it appears that cramp symptoms and walking functionality improved and remained enhanced, during intervention period. Perceived fatigue barely changed, but improvements were seen from the baseline to t2. However, the 6MWT showed some information about the degree of fatigability of lower limb muscles, which have improved. It appears that local muscle physical therapy management only has local effects on muscle resistance and on function (as walking) but it can't be directly related to quality of life.

One systematic review [17] about the effects of exercise and physiotherapy in patients with neuromuscular disorders found that strengthening and aerobic exercise programs in subjects with muscular problems has benefits in body function, activities and participation (according to ICF), as respiratory training in patients with myasthenia gravis. However, only exercise-based programs (strengthening or aerobic) and respiratory component were found in RCTs, not verifying the effects of passive interventions based on stretching, massage and heat. The only study found also applying passive modalities to subjects with neuromuscular disorders is not comparable with this study, because subjects selected had to have an acute episode of dermato/polymyositis [18].

To our knowledge, this is the first study applying only specific physical therapy modalities in patients with NMT. Other studies in patients with NMT focused main results on immunologic therapy [12,19,20]. The contribution of this paper is to make health care practitioners aware of non-pharmacological approaches as an additional therapy for the management of patients with this disease.

This study has some limitations, like the fact that the patient had a short time period between his previous physical therapy sessions and the beginning of this study. Second, this disease is affecting several muscles in patient's body, but the intervention was only performed in one specific group of muscles. Third, the lack of valid and reliable instruments of quality of life and function for patients with NMT limits their application.

## Summary

The improvements found in this case study present preliminary evidence for the effectiveness of physical therapy management for patients with NMT in some symptoms and function. To this date, the main scientific information about NMT is related to pharmacological therapy, regarding its etiology. Since it's a

long-term disease, it is important to establish the management of symptoms by non-pharmacological approaches that could also add some benefits. The objective of this research was to determine the effects of a traditional physical therapy intervention in this case. Other non-pharmacological interventions should be studied on their own or along with other therapies to help in management of function and quality of life in these patients.

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