

Case Report

Rehabilitation of a Patient with Multiple Sclerosis: A Case Study

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Abstract

Multiple sclerosis is a progressive demyelinating disease of the Central Nervous System (CNS). It presents with a wide variety of motor and sensory symptoms. Often, as the disease progresses, it can cause debilitating handicap of the patient rendering them unable to carry out their activities of daily living. Along with the medical treatment support, physio-therapeutic rehabilitation can help in reducing the handicap of the patients. The authors present a case of one such patient diagnosed with secondary progressive multiple sclerosis describing the role of physiotherapy in management of symptoms related to the disease.

Keywords: Neurological rehabilitation; Multiple sclerosis; Aerobic training; Task oriented circuit training; Physiotherapy

Introduction

Multiple Sclerosis (MS) is a chronic, inflammatory, demyelinating disease of CNS that affects cerebral cortex and grey matter including basal ganglia and Cerebellar cortex [1]. MS prevails in a total of 2.8 million people worldwide according to a study conducted in 2020 with an estimation of one person being diagnosed with MS every five minutes [2]. The incidence in females is twice as higher than that in males. Autoimmune process and neuro-degeneration is considered to be the main culprit behind the disease, although the exact pathogenesis and aetiology is not fully understood [1].

There is a wide range of symptoms seen in MS including weakness, spasticity, gait and balance problems, urinary incontinence, postural sway, sensory loss etc [1]. In recent years, physical therapy strategies have evolved to provide significant symptomatic relief in this patient population [3]. Various researches have been done on the effectiveness of exercise therapy in MS and a significant improvement in cardiovascular endurance, gait and balance was seen [4]. The purpose of this case report is to illustrate a picture of the clinical features of a patient with Secondary Progressive Multiple Sclerosis (SPMS) (Figure 1) and proposing an evidence-based rehabilitation protocol to address the activity limitation and participation restriction of the patient.

Case Presentation

A 37 years old male, known case of SPMS diagnosed presented with difficulty in performing Instrumental Activities of Daily Living

(IADLs), difficulty in standing without support and inability to walk without support. History of the patient dates back to 2008 when the patient first complained of blurring of vision, diplopia and left sided facial weakness. Steroid injections were administered and the symptoms transiently improved. As the disease progressed, the patient developed difficulty in walking and poor balance control. Intention tremors of hand hindered with the IADLs like holding objects, opening lids, writing and feeding. Increased fatigue and worsening of symptoms related to exposure to the sun for prolonged periods was reported in the last two years. Other symptoms included erectile dysfunction, slurring of speech, urinary incontinence, constipation and dysphagia. Recently, the patient had also developed sensory impairment in bilateral feet. There is no family history of similar complaints/symptoms.

MRI Brain showed multi-facial, ovoid and confluent lesions in supratentorial parenchyma and brainstem with some of them showing peripheral enhancement and MRI Spinal Cord showed multiple short segment T2 hyperintense cord signal changes in cervical & thoracic region. These were suggestive of active demyelination. The distal latencies, F-waves, Compound Muscle Action Potential (CMAP) amplitude, motor and sensory Nerve Conduction Velocity (NCV) was normal in median, ulnar, peroneal and tibial nerves. Both the H-reflexes and sural NCVs were normal. Through the investigations done the final diagnosis of secondary progressive multiple sclerosis was made and the patient was referred for physiotherapy where in a detailed examination was done. This was followed by formulating a problem list of the patient and designing patient specific evidence based protocol (Table 1).

The goals of the therapy were set after discussing with the patient and incorporating his opinions in the process. The problem list is as mentioned:

1. Inability to eat food independently.
2. Inability to assume standing from bed independently.
3. Inability to maintain balance while standing.
4. Inability to walk independently.

Citation: Chawla NS, Gandhi DBC, Kohli P. Rehabilitation of a Patient with Multiple Sclerosis: A Case Study. *Ann Clin Case Stud.* 2022; 4(2): 1053.

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Publisher Name: Medtext Publications LLC

Manuscript compiled: May 19th, 2022

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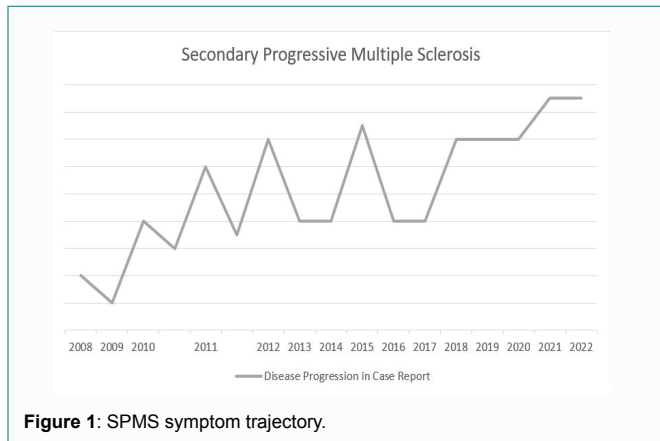


Figure 1: SPMS symptom trajectory.

The protocol was planned in a way to give enough rest periods to the patient in between exercises [5]. Simple exercises were selected which would be easy to follow up as home protocol after discharge from the hospital. Treatment included Progressive Resisted Exercises (PRE) for proximal muscle groups of lower limbs [6]. After 30-60 minutes of administration of prescribed drugs (methotrexate), exercises which involved isometric contraction of distal hand and forearm muscles were done to help with the tremors [7]. Arm circles, bicycle kicks and triceps pushes were used for cardiorespiratory training in sitting and lying position [8,9]. Task-Oriented Circuit Training (TOCT) was incorporated for five days a week and the intensity was varied according to the patient's tolerance [10]. The TOCT comprised of activities like stepping up and down on a stepper, long steps on the ground, ball kicking, and catch and throw a ball, etc [11,12]. The training was carried out for a period of two weeks and the outcome measures (Table 2), 10 Meter Walk Test (MWT), Fatigue Severity Scale (FSS) were compared before and after the intervention period [13].

Towards the end of two weeks, the patient was given videos for reference to follow-up as a home protocol. The patient showed a small meaningful change in 10MWT score before and after intervention. FSS also showed slight improvement. Other than that, the patient also reported perceived improvement in IADLs, although Modified Barthel Index score did not show a significant improvement.

Table 1: Physiotherapy Assessment.

| Physiotherapy Assessment | |
|--|---|
| Examination | Finding |
| Mini Mental Status Examination Score | 25/30 |
| Speech | Staccato |
| Cranial Nerve Examination Findings | Impaired colour vision, Partial lateral rectus palsy, Gaze evoked nystagmus-horizontal, Absent Jaw jerk, Weakness of left side of the face and vestibular component of eighth nerve couldn't be assessed. |
| Muscle Bulk | Normal, No obvious muscle wasting |
| Muscle Tone (Modified Ashworth Scale Grading) | Upper limbs: Grade 1 Lower limbs: Grade 2 |
| Tremors | Intention type: Present in bilateral hands, About 4cm of amplitude |
| Muscle power Medical Research Council(MRC) Grading | Weakness in proximal muscle groups of bilateral lower limbs (MRC Grade 3-) |
| Berg Balance Scale score | 16/56 |
| Modified Barthel Index score | 20-Aug |
| Deep Tendon Reflexes | Present bilaterally |
| Sensory Testing | Decreased proprioception and vibration in Bilateral feet (Distal and proximal interphalangeal joints) |
| Cerebellar Signs | Finger nose test: Impaired Heel to shin test: Impaired Dysdiadochokinesia present |
| Gait | Wide based, short step length, slow speed |
| Expanded Disability Status Scale score | 6 |

Table 2: Outcome Measures.

| Reporting Outcome Measures | | |
|------------------------------|---------------|-------------|
| Outcome Measure | Initial Score | Final score |
| 10 MWT | 0.42m/s | 0.48m/s |
| FSS | 49/63 | 43/63 |
| Modified Barthel Index score | 20-Aug | 20-Sep |

Discussion

This case study looks into the clinical features of a 37 year old male. The patient initially presented in 2008 with symptoms of diplopia, blurring of vision and difficulty in walking. As the disease advanced, tremors of hands, dysarthria, dysphagia, incontinence, erectile dysfunction, and sensory issues also surfaced and the patient became dependent in ambulation with balance deficits. Subsequent to MRI findings of multifocal active demyelination, the diagnosis with SPMS was confirmed by the neurologist. The patient was referred to neuro-physiotherapy and a thorough assessment was carried out. Following this, a comprehensive rehabilitation program was tailor-made for the patient that catered to his specific needs. This two-week intervention protocol included TOCT, cardiorespiratory training and interventions for tremors to help with IADLs [5].

According to a systematic review conducted by Kjølhede et al. [6], there is a strong evidence to support the positive effects of PRE for muscle strengthening. Similar findings were reported in our case study. Improvement translated in improving the 10MWT. According to Durbada et al. [7], isometric training of muscles leads to neural changes and changes in stretch reflex behavior. This is reported to attribute to the reduction of tremors. In this case study, isometric training was applied to distal muscles of the hand. This led to a decrease in the amplitude of tremors improving the patient's performance in ADLs. In a Randomised Control Trial (RCT) by Rampello et al. [8], it was reported that there is strong evidence to support the use of aerobic training in patients with MS. The findings were seconded by another recent RCT by Grazioli E et al. [9] which reported an improvement in walking capacity and exercise tolerance. Similar results were noted after a two week intervention in this case report. Improvement was quantified in terms of 10MWT and FSS.

TOCT has been recommended as a therapeutic approach to target endurance in patients with MS. According to Chisari et al. [11]

TOCT has a positive impact on the motor function in patients with MS. Tramonti et al. [12] also confirmed similar findings and reported an improvement in gait dynamics after TOCT in MS patients. In this particular case study, TOCT was associated with improving gait dynamics and improvements translated to an improvement in 10 MWT and Modified Barthel Index score. Furthermore, a home-program was planned and shared with the patient *via* videos [14]. The main implications of the case study suggest the positive effects of the implementation of a multi-disciplinary approach to the care of patients with MS. Utilising outcome measures that can directly translate into patient recovery also play a key role in quantifying the success of the rehabilitation intervention. Patient education and involvement in goal-setting aids to a better adherence to the intervention. The drawback of this case study is that proper dosage of training could not be documented due to constant modification in dosage as per patient condition. This can be attributed to the progressive nature of the disease. Further studies can be targeted on standardising the dosage.

Conclusion

Treating a patient with MS can be trivial and involvement of a multi-disciplinary team should be the ideal approach. A tailor-made rehabilitation intervention is required in each case, depending upon the patient's problem list. Evidence based interventions for balance, gait and strengthening can bring out desired results in patients and specific outcome measures can be used to quantify and report clinically meaningful changes in the patient symptoms.

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