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A Study to Assess Effectiveness of Physiotherapy Treatment in Transverse Myelitis: A Case Report

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KEYWORDS

Transverse Myelitis, Physiotherapy, Strengthening, Functional recovery

ABSTRACT:

This study investigates the efficacy of a structured physiotherapy intervention in improving muscle strength and functional outcomes for a patient presenting with muscle weakness. The pre- and post-physiotherapy assessments included manual muscle testing and functional outcome measures. Results revealed significant improvements in muscle strength across various upper and lower limb muscle groups, with most muscles progressing from initial deficits to full strength post-physiotherapy. Functional outcomes, assessed using the Functional Independence Measure (FIM) and Berg Balance Scale (BBS), demonstrated remarkable enhancements in independence and balance post-intervention. The findings highlight the effectiveness of the comprehensive rehabilitation program in promoting muscle recovery and enhancing functional abilities. These results emphasize the importance of tailored physiotherapy interventions in addressing muscle weakness and improving overall quality of life for individuals with similar impairments. Further research is warranted to optimize rehabilitation strategies and explore the long-term impact of such interventions.

1. Introduction

Transverse myelitis (TM) is defined as a neurological disorder of focal inflammation in the spinal cord that can result in motor, sensory, and autonomic dysfunction below the level of the lesion.1,2 There are three main categories of differential diagnoses for TM, including demyelination (i.e. MS, neuromyelitis optica, and idiopathic transverse myelitis), infection (i.e. varicella zoster, herpes simplex virus), and inflammatory autoimmune disorders (i.e. systemic lupus erythematosus, neurosarcoidosis).3

The pathology of the disease process causes inflammation and destruction of the myelin (white matter) supporting the spinal cord, swelling and inflammation of the spinal cord tissue (grey matter), and results in scarring within and around the spinal cord itself. While the inflammatory process causes the acute symptoms that lead to the diagnosis, the lasting pathology is thought to be because of the scarring within the spinal cord interfering with nerve signalling.4

A 54-year-old male, Dr. Bijay Bhujbal - Professor by occupation had complaint of fever, burning micturition with pain, weakness and then taken general medicines. After 3 days he was having persistent fever, headache and sudden episode of fainting. Then he was shifted to Gokul hospital and all the investigations including brain MRI, USG, CSF examination etc. and diagnosed to have Transverse Myelitis (C3-C7, D10-D12) with Polyneuropathy. He was admitted for 1 month at Gokul hospital in July 2022. He had the history of COVID-19 in Feb 2022. He has a history of diabetes mellitus for 10-12 years and was taking medicines for the same. After discharge from Gokul hospital, he was advised to take insulin along with other medicines.

A wheelchair bound patient after being discharge from the hospital came to physiotherapy treatment (15-10-2022). Initial complaints were not able to walk

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independently, not able to transfer himself, difficulty in bathing, grooming and all the activities of daily living and bilateral puffy feet. On examination, the patient was conscious, orientation, perception cognition, attention, memory, speech was intact, altered sensations (occasionally) in bilateral feet (plantar surface).

Brain MRI CT Scan Chest (10-8-2022) – focal ill-defined soft tossie attenuation areas in posterior segments of bilateral lower lobes. Few ground glass opacities are seen in right lower lobe. Bilateral pleural effusion is noted (RT>LT)

MRI Whole spine (16-8-2022) Transverse myelitis involving cervical (C3 to C7) and Dorsal (D9 to L1) cord. Asymmetric posterior disc osteophytic complexes at C5-C6 level with ligamentum flavum thickening. Diffuse disc buldge at L5-S1 causing compression over anterior thecal sac.

EMG/NCV report (Upper and lower limb) (10-8-2022) B/L Upper limb – axonal degenerative type sensory poly radiculomyelopathy. B/L Lower limb – demyelinating type of sensory motor polyradiculoneuropathy (sensory > motor)

MRI Brain – mild age-related cerebral atrophy with changes of small vessel ischemic changes.

2. Methods

The initial phase of treatment encompassed a structured exercise regimen targeting bilateral upper and lower limb rehabilitation. For the upper limb, physiotherapy interventions comprised active assisted range of motion (ROM) exercises focusing on the shoulder and elbow joints, with 10 repetitions each. Additionally, stretching exercises for the wrist flexors and extensors were administered with 5 repetitions each. Lower limb rehabilitation involved assisted ROM exercises for the hip, knee, and ankle joints, along with stretching exercises for the calf, hamstrings, and adductors, also with 5 repetitions each. Electrical stimulation of bilateral quadriceps muscles was conducted using Surge faradic mode for 10 minutes per session over 12 days. Transfer activities were instructed to the patient and their relatives to facilitate independent movement.

After one month, progress was observed, and the rehabilitation protocol was adjusted to include active ROM exercises for bilateral upper and lower limb joints, with emphasis on wrists and ankles due to distal muscle weakness. The exercises were performed initially in bed, in supine, side-lying, and sitting positions, gradually progressing to functional and weight-bearing positions such as sitting and standing. Gripping exercises, including self-assisted exercises, spring, ball press, and ball rolling exercises, were incorporated, along with activities like sit-to-stand maneuvers, standing with manual support and walker assistance, and supervised walking with a walker. Stair climbing with manual support was introduced after 1.5 to 2 months, followed by cycling for 5 minutes, gradually increasing to 10 minutes over 2 to 2.5 months.

At the three-month mark, strengthening exercises were integrated into the regimen, focusing on bilateral shoulder, elbow, hip, and knee joints, using 500 grams weight for 10 repetitions each. Isometric exercises were prescribed for the wrist muscle group, while TheraBand exercises targeted the ankle muscle group and intrinsic muscles. Additional exercises included those with Theraputty, sideways and backward walking, wall-supported semi-squats under supervision, squatting exercises, and treadmill walking for 5 minutes without inclination at a speed of 1.5 mph.

Progression in strength training ensued, gradually increasing weights from 500 grams to 1 kg, then to 1.5 kg, and finally to 2 kg. TheraBand exercises for the wrist and intrinsic muscles were continued, alongside marching in standing position, one-leg standing to enhance static balance, and Frenkel's exercises to improve dynamic balance. Treadmill walking duration was extended to 10-15 minutes without inclination, maintaining a speed of 1.5 mph.

3. Results

MANUAL MUSCLE TESTING	NAME OF MUSCLES	PRE-PHYSIOTHERAPY TREATMENT	POST-PHYSIOTHERAPY TREATMENT
UPPER LIMB	SHOULDER FLEXORS	3	5

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	EXTENSORS	3	5
	ABDUCTORS	3	5
	ADDUCTORS	3	5
	EXTERNAL ROTATORS	3	5
	INTERNAL ROTATORS	3	5
	ELBOW FLEXORS	2+	5
	EXTENSORS	3	5
	WRIST FLEXORS	2	5
	EXTENSORS	2	5
	INTRINSIC MUSCLES	Weak	Strong
	LUMBRICALS	Weak	Strong
LOWER LIMB	HIP FLEXORS	3	5
	EXTENSORS	2+	5
	ABDUCTORS	3	5
	ADDUCTORS	3	5
	EXTERNAL ROTATORS	3	5
	INTERNAL ROTATORS	3	5
	KNEE FLEXORS	3	5
	EXTENSORS	2	5
	ANKLE DORSIFLEXORS	2	5
	PLANTAR FLEXORS	2	5

Table 1: Pre and post physiotherapy findings

In the pre-physiotherapy evaluation, the manual muscle testing revealed varying degrees of muscle strength deficits across the upper and lower limbs. Muscles involved in shoulder flexion, extension, abduction, adduction, external and internal rotation, as well as elbow flexion and wrist movements, exhibited impairment ranging from grade 2+ to grade 3. Additionally, weakness in intrinsic hand muscles, particularly the lumbricals, was noted. Lower limb muscle groups, including hip flexors, extensors, abductors, adductors, and knee flexors, displayed similar weaknesses, with ankle dorsiflexors and plantar flexors also exhibiting diminished strength, graded at level 2.

OUTCOME MEASURE	PRE-PHYSIOTHERAPY TREATMENT	POST-PHYSIOTHERAPY TREATMENT
FIM	93	119
BBS	4	45

Table 2: Outcome Measures

Following the structured physiotherapy intervention, significant improvements were observed in muscle strength across all assessed muscle groups. Post-physiotherapy evaluation indicated notable enhancements, with muscle strength reaching grade 5 in most upper and lower limb muscles, reflecting

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substantial progress from the pre-physiotherapy state. Moreover, the patient exhibited remarkable improvements in functional abilities, as evidenced by an increase in FIM scores from 93 to 119, indicating enhanced independence and functional mobility. Similarly, the patient's balance, as measured by the Berg Balance Scale (BBS), demonstrated a remarkable improvement from a baseline score of 4 to a post-physiotherapy score of 45, underscoring the effectiveness of the comprehensive rehabilitation program in restoring both muscle strength and functional capacity.

4. Discussion

The observed improvements in muscle strength and functional outcomes following the structured physiotherapy intervention underscore the effectiveness of the rehabilitation program in addressing the patient's impairments. The significant enhancements noted across various muscle groups, from the upper limbs involving shoulder and elbow movements to the lower limbs encompassing hip, knee, and ankle functions, suggest the comprehensive nature of the treatment approach. The progression from initial deficits, such as weakness graded at 2+ to 3 in several muscle groups, to achieving full strength graded at level 5 post-physiotherapy, reflects the success of the tailored exercise regimen in promoting muscle recovery and rehabilitation.

Moreover, the observed improvements in functional abilities, as indicated by the substantial increase in FIM scores from 93 to 119, signify the translation of enhanced muscle strength into meaningful gains in independence and functional mobility for the patient. The ability to perform activities of daily living with greater ease and reduced assistance post-physiotherapy highlights the holistic nature of the rehabilitation program, which not only targeted muscle strength but also focused on promoting functional autonomy.

Furthermore, the remarkable enhancement in balance, as evidenced by the significant increase in Berg Balance Scale scores from 4 to 45, underscores the multifaceted benefits of the physiotherapy intervention. Improved balance is crucial for preventing falls and enhancing overall stability, indicating the program's effectiveness in addressing both muscle strength deficits and balance impairments.

Overall, the findings suggest that a structured and progressive physiotherapy regimen can lead to significant improvements in muscle strength and functional outcomes for individuals with muscle weakness or impairment. Future research may further explore the specific components of the rehabilitation program that contributed most significantly to the observed gains and optimize interventions for tailored and effective rehabilitation strategies.

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