

A Multimodal Rehabilitation Program for a Patient with Relapsing Remitting Multiple Sclerosis: A Case Report

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Abstract: Introduction: Multiple sclerosis (MS) is a chronic inflammatory, demyelinating disease of the central nervous system. Prevalence of 3/100,000 for India. Case presentation: 40 years female; relapsing remitting multiple sclerosis. Patient had complaint of stiffness and weakness of both limbs while walking, associated with imbalance, urinary complains and visual problems all since last 2 years. Patient had started physiotherapy from 21st July 2015. Management and Outcome: Multimodal rehabilitation programme includes cardiovascular activity, stretching, PNF, task oriented approach, balance and core muscle strengthening exercises. Outcome measures were BBS, TUG, Functional gait Index, Gait parameters, FIM, Fatigue Impairment scale. Discussion: Task oriented approach and PNF helps in maintaining static and dynamic balance and gait deviation. Activity pacing Maintained activity tolerance without reports of fatigue after therapy. CV endurance exercises helps in ↑ Aerobic capacity, functional ability, and Quality of Life for those with disabilities and chronic diseases. Conclusion: Proprioceptive neuromuscular facilitation (PNF) and Task oriented approach and balance exercises helps in attain optimum level of function and increase quality of life.

Keywords: Multiple sclerosis, multimodal programme, Balance, Fatigue, Gait

1. Introduction

Multiple sclerosis, also known as MS, is a chronic disease that attacks the central nervous system, i.e. the brain, spinal cord and optic nerves. In severe cases, the patient becomes paralyzed or blind while in milder cases there may be numbness in the limbs. Multiple sclerosis can affect people of all ages. It is more common among people aged from 20 to 50 years. More women develop MS than men.

While the cause is not clear, the underlying mechanism is thought to be either destruction by the immune system or failure of the myelin-producing cells.⁽¹⁾ Proposed causes for this include genetics and environmental factors such as being triggered by a viral infection^(2,3) MS is usually diagnosed based on the presenting signs and symptoms and the results of supporting medical tests.⁽⁴⁾ Depending on the localization and characteristics of the morphological changes in both white and gray brain matter, different symptoms and signs may occur, such as visual impairment, Dysarthria and dysphasia, spasticity, paresis, coordination and balance impairment, ataxia, pain, sensory impairment, bladder, bowel and sexual dysfunction. Fatigue, emotional and cognitive changes are also frequently present in MS⁽⁴⁻⁶⁾

These symptoms, often in combination with a lack of confidence in one's own capabilities and abilities to manage the symptoms, lead to impaired functional capacity and subsequently reduced physical and sporting activity as well as reduced quality of life⁽¹⁴⁻¹⁸⁾. As in other conditions with reduced mobility, in MS the lack of physical activity can lead to secondary sequelae such as obesity, osteoporosis, and/or cardiovascular damage which in turn pose a serious threat to patients as they increase the risk of further complications like thrombosis, pulmonary embolisms, upper respiratory or urinary tract infections, or prominent decubital ulcers^(15,16,19).

There is no known cure for multiple sclerosis.⁽⁷⁾ Treatments attempt to improve function after an attack and prevent new attacks.⁽³⁾ Typically MS involves a series of relapses and prognosis is unpredictable, although a small proportion of people with MS (15%) have a steady progression of disability.⁽¹⁾ Some people with MS can develop complex patterns of disability affecting physical and social function.⁽⁸⁾ Problems with mobility, balance, fatigue and spasticity are common.⁽³⁾

The physical therapist evaluates and addresses the body's ability to move and function, with particular emphasis on walking, strength, balance, posture, fatigue, and pain. Physiotherapy intervention and advice early after diagnosis can reduce disability, maximize potential for independence, improve employment sustainability and reduce the impact that the disease has on health and quality of life factors.⁽⁹⁾ There is a strong body of evidence demonstrating that exercise used as part of a rehabilitation programme can increase activity and improve the health and well-being of people with MS.⁽¹⁰⁾ Physical Therapy also helps in improving balance problems, weakness, Pain and saving energy. For some, Physical therapy offered either a relapse or it will change in symptoms such as increased muscle stiffness or mobility problems.

PT might include stretching, range-of-motion and strengthening exercises, gait training, and training in the use of mobility aids (canes, crutches, scooters and wheelchairs) and other assistive devices. The ultimate goal is to achieve and maintain optimal functioning and prevent unnecessary complications such as de-conditioning, muscle weakness from lack of mobility, and muscle contractures related to spasticity.

2. Case Presentation

40 years female come to physiotherapy OPD with intention tremors, Nystagmus, scanning speech. The patient was house wife. She is living with her husband. She is emotional, talkative and co operative. Three years back she had difficulty in walking. After one year difficulty has increased and she needed assistance for walking. She also experienced impaired balance, and stiffness of lower limb, dependent in activity of daily living. She took ayurvedic, homeopathic, Ceragem, naturopathy treatments but not satisfied. In March 2014 her MRI was done and diagnosed as having multiple sclerosis. Findings showed Multiple, small round to oval shaped hyper intensities are seen in the deep periventricular white matter and Centrum semiovate- perpendicular to colosso-septal interphase (Dawson's finger appearance).

She was admitted in Jun 2014 for complaint of stiffness and weakness of both limbs while walking, associated with imbalance, urinary complains and visual problems all since last 2 years. Again after one year she started difficulty in speaking, continuous shaking of extremities and difficulty in vision. So she was advised for MRI and it was done. Findings suggest of old multiple sclerosis lesions. As compared to previous MRI there is reduction in demyelisation plaques in cerebral white matter, no acute or active demyelination plaque. Rest of the finding was same. Patient had started physiotherapy from 21st July 2015.

Comprehensive Physical therapy Examination prior to Intervention includes Range of motion, functional strength, muscular tightness, tonal examination, neurological status etc. She was examined for balance, gait, functional status, fatigue and cardiovascular endurance. Disease specific examination includes intention tremors, Nystagmus, scanning speech, Lhermitte's sign, Uthoff's sign.

3. Management and Outcome

Pre intervention for baseline data BBS score and TUG were taken for balance. Score of FIM was taken to decide her functional level. Gait was assessed by functional Gait Index. To know the severity of Fatigue Modified fatigue impact scale score was taken. Borg scale of perceived exertion was taken to know the cardiovascular Endurance.

Treatment was given in the form of warm up exercises (cardiovascular activity), Stretching, PNF, task oriented approach, balance exercises and core muscle strengthening exercises

Dynamic balance exercises include sitting and standing balance, PNF includes chop reverse chop and rhythmic stabilization exercises. Core stability and strengthening exercises includes NDT postures like quadruped, bridging therapy ball exercise like bouncing, anteroposterior and side to side swing. Stretching exercise was given to improve mobility and gait parameters. Exercises for balance strategy include visual, verbal and stepping strategy. Dual task training was given by walkie- talkie method and obstacle avoidance walking. One leg standing and marching in the place was also given. To improve cardiovascular endurance initially static cycling and walking with moderate intensity

and progression was made by giving moderate intensity treadmill walking. Total duration of session 1 hour/day thrice week.

Table 1: Multimodal Exercise Programme

| Exercises | Description |
|--|--|
| Cardiovascular activity | Warm up exercises, static cycling, treadmill walking |
| Stretching | |
| PNF | Chop-reverse chop, rhythmic stabilization |
| Task oriented approach | Picking up an object |
| Balance Exercises | Sitting and standing balance exercise One leg standing Marching in place |
| Balance strategy Exercises Visual, verbal and stepping strategy exercises | Dual task training by walkie talkie method Obstacle avoiding walking |
| NDT postures | Quadruped, bridging |
| Core stability and strengthening exercise | Bouncing, anteroposterior and side to side swing |

Table 2: Balance assessment scale comparison

| | Initial | 3 Months | 6 Months |
|-----|---------|----------|----------|
| BBS | 36 | 43 | 48 |
| TUG | 32sec | 28.6sec | 25.2sec |

Table 3: Scores of Functional Gait Index and Gait deviations

| | Initial | 3 Months | 6 Months |
|-----------------------|---|------------------------------------|---|
| Functional Gait Index | 10 | 13 | 17 |
| Gait Deviation | Slow speed Wide BOS Increased sway Increased step length | Slow speed Wide BOS Mod sway | Slight less to normal Normal BOS Min sway |

Table 4: FIM score

| | Initial | 3 Months | 6months |
|-------------------|--------------------|--------------------|------------------------|
| Self Care | Min/sup assistance | Supervision | Mod/independence (6/7) |
| Sphincter Control | Mod/min assistance | Min assistance | Mod assistance (6) |
| Transfers | Mod assistance | Min/sup | Independence (7) |
| Locomotion | Max assistance | Min/mod assistance | Supervision (5) |
| Communication | Independence | independence | Independence (7) |
| Social Congnition | Mod assistance | independence | Independence (7) |

Table 5: Scores of Fatigue Impairment Scale

| | Initial | 3 Months | 6 Months |
|-----------------------|---------|----------|----------|
| Physical Fatigue | 27 | 19 | 14 (36) |
| Mental Fatigue | 25 | 19 | 13 (40) |
| Psychological Fatigue | 7 | 5 | 3 (8) |
| Total | 59 | 43 | 30 (84) |

4. Result

Scores of BBS and TUG suggest that Static balance is achieved and less impairment in dynamic balance was seen

with Intervention. After Intervention gait deviation has been reduced. FIM score suggest that only supervision or complete independent is achieved after intervention. Fatigue Impact scale Score is less than half of total score. Less mental, physical and psychosocial fatigue.

5. Discussion

Multimodal Exercise Programme can help decrease complications that arise from muscular fatigue, weakness, contractures, and spasticity. Additionally, exercise can serve as an outlet for stress reduction and help maximize independence, regardless of one's ability. Secondary complications of spasticity, muscular tension and muscle atrophy can decrease. Level of independence may increase and Isolation and depression may decrease.

Physiotherapy is one of the basic methods of MS rehabilitation and aims at improving motor function, stability of gait, and walking capabilities. Moreover, endurance and physical fitness may also be strengthened and thus, fatigue may be ameliorated. There is good evidence that exercise has positive effects on balance⁽¹⁶⁾, mobility⁽¹⁷⁾, muscle weakness⁽¹⁸⁻²⁰⁾, depression⁽²¹⁾, and fatigue⁽²²⁾.

CV endurance exercises helps in ↑ Aerobic capacity, functional ability, and Quality of Life for those with disabilities and chronic diseases. One study suggest that cycling progressive resistance training, may improve balance, fatigue, and depression and reduce fear of falling in patients with multiple sclerosis without worsening multiple sclerosis signs and symptoms. Breathing can become deeper and more regular. Circulation can increase, bringing oxygen throughout the body. This might be the reason for improvement of Borg PER score after Intervention in this Patient.

One pilot study has shown that an 8-week period of an exercise program containing aerobic, resistance, and balance training was associated with improvements in participant-rated, performance, and kinematic markers of walking mobility in a small sample of persons with MS who had significant disability. In addition to this stretching exercise, balance exercises in standing, marching in place has improved scores of functional Gait Index and reduced sway while walking.⁽²³⁾

A pilot study conducted by Cattaneo D concluded that Balance rehabilitation appeared to be a useful tool in reducing the fall rate and improving balance skills in subjects with multiple sclerosis. Exercises in different sensory contexts may have an impact in improving dynamic balance.

Balance control is an integral component of all daily activities, but its complex and flexible nature makes it difficult to assess adequately. Understanding the biomechanical and information processing demands imposed by the task and by the environmental context allows us to evaluate their probable impact on motor performance and balance. Task oriented approach and PNF helps in maintaining static and dynamic balance and gait deviation. Task-oriented approach and a facilitation

approach to the treatment of MS outpatients were associated with improved mobility.

PT interventions for the improvement of balance have adopted various theoretic approaches, e.g. motor and sensory strategies⁽²⁵⁾, Feldenkrais⁽²⁶⁾ and neuromuscular facilitation^(27, 28). Some significant effects on balance compared with no/placebo treatment^(25, 28) were found. Adequate balance relies on inputs from the visual, Somatosensory and vestibular systems⁽²⁹⁾, which are frequently impaired in people with MS⁽³⁰⁾. Muscle weakness and spasticity have been found to further compromise the ability to balance, as they affect the sequencing and force of muscle contraction. This is the reason why Patient shows improvement after Balance strategy Exercises like Visual, verbal and stepping strategy exercises such as Dual task training by walkie talkie method, Obstacle avoiding walking.

Fatigue is one of the most common and debilitating symptoms in MS which all may impact activities of daily living and work ability [RIMS (21)]. Activity pacing Maintained activity tolerance without reports of fatigue after therapy. Fatigue can be better managed by activity pacing method.

6. Conclusion

Multimodal Programme consists of warm up exercises (cardiovascular activity), Stretching, PNF, task oriented approach, balance exercises and core muscle strengthening exercises is helpful in Improving Balance Problem, Gait dysfunction, Functional mobility, activity tolerance (Fatigue), cardio-respiratory endurance and Functional ability.

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