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Targeted Physiotherapy Rehabilitation for Trunk Control, Balance, and Coordination in Miller Fisher Syndrome: A Case Study

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Abstract:

Miller Fisher syndrome (MFS) is a rare and atypical variant of Guillain–Barré syndrome, classically characterized by the triad of areflexia, ataxia, and ophthalmoplegia. It is often associated with involvement of cranial nerves and leads to significant motor, sensory, and functional impairments.There is limited evidence describing structured physiotherapy rehabilitation protocols targeting trunk control, balance, and coordination. This study is needed to highlight the role of targeted, phase-wise physiotherapy in functional recovery, provide clinical guidance for rehabilitation planning, and contribute practical evidence that can help physiotherapists manage similar cases more effectively in the future. This case study describes a 72-year-old male diagnosed with Miller Fisher syndrome who presented with loss of eye movements, limb weakness, impaired balance, coordination deficits, and marked difficulty in performing activities of daily living. A structured physiotherapy rehabilitation program was implemented, focusing on balance and coordination training, muscle strengthening, gait training, and task-oriented functional activities aimed at improving independence in daily living. Functional outcomes were assessed before and after the intervention using standardized measures.Following physiotherapy rehabilitation, the patient demonstrated notable improvement in balance, strength, mobility, and ability to perform activities of daily living with reduced assistance.

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Keywords: Guillain barre syndrome, Miller fisher syndrome, Opthalmoplegia, Ataxia, Rehabilitation, Activities of daily living.

Introduction:

Miller Fisher syndrome (MFS) is a rare, acute, immune-mediated neurological disorder and a rare variant of Guillain–Barré syndrome (GBS),it was first described by Charles Miller Fisher in 1956(1). It is classically characterized by the triad of ophthalmoplegia, ataxia, and areflexia. The MFS predominantly affects cranial nerves and sensory pathways, with minimal limb weakness in many patients.It accounts for approximately 5–10% of all GBS cases, with an estimated annual incidence of 1–2 cases per million population(3). It is reported more frequently in Asian populations and shows a slight male predominance, commonly affecting middle-aged and elderly individuals. The condition is often preceded by an infectious illness, most commonly *Campylobacter jejuni* and *Haemophilus influenzae*, although the causative pathogen remains unidentified in many cases(1).

The pathophysiology of MFS is primarily autoimmune, mediated by molecular mimicry following infection. Anti-GQ1b antibodies target gangliosides expressed in cranial nerves, muscle spindle afferents, and cerebellar pathways, leading to impaired nerve conduction. This results in ophthalmoplegia, ataxia, and loss of deep tendon reflexes. Demyelination is less prominent compared to other GBS variants, with functional nerve disruption playing a key role in symptom development(3,4).

Case presentation:

A 72-year-old male farmer presented with acute-onset neurological symptoms, including loss of eye movements and slurred speech of one week’s duration. He also reported progressive weakness of both upper and lower limbs over the same period, significantly limiting his functional abilities. Associated symptoms included paresthesia in both hands and feet and a history of dry cough without sputum for six days.

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The patient experienced intentional tremors in both hands, interfering with fine motor tasks such as eating and holding the objects. Due to generalized weakness, impaired coordination, and poor postural control, he was unable to maintain sitting without support and had marked difficulty performing activities of daily living, including eating, dressing, bed mobility, transfers, standing, and ambulation, resulting in increased dependence on others.

He was reportedly asymptomatic until 27/10/2025, when he developed progressive limb weakness, tingling sensations, slurred speech, and abnormal eye movements. He was initially taken to a local hospital, that did not result in clinical improvement, following which he was referred to Sri Venkateswara Institute of Medical Sciences (SVIMS) Neurology ward. Based on clinical evaluation and investigations, a diagnosis of Miller Fisher syndrome(MFS) was made, and comprehensive medical management with structured physiotherapy rehabilitation depending on ICF model was initiated from day 1 along with IVIG antibodies.The patient was a known case of hypertension for the past three years, managed regularly with Telmisartan 40 mg. He underwent glaucoma surgery in the right eye two years ago. There was no significant family history, and his personal history is unremarkable, with no history of alcohol consumption or tobacco use.

Clinical findings of a patient with miller fisher syndrome:

Table 1: findings of patient.

Clinical domain	**Findings**
Glasgow coma scale	15/15 (the patient is conscious and oriented)
Mini mental status examination	28/30 (the patient is oriented)
Cranial nerve examination	Occulomotor, trochlear and abducens nerves are affected. (loss of eye movements)
sensations	Superficial sensations are perceived, but deep and combined cortical sensations are not perceived.
Muscle tone	Normal in all four limbs
Manual muscle testing	All the muscle groups of upper limbs and

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	lower limbs have 3/5 I.e., patient is able to do full range of motion against gravity
Reflexes	Superficial reflexes are normal but deep reflexes are absent.
Cerebellar examination	Gait ataxia,Positive Romberg's test, Finger–nose test: Incoordination, Heel–shin test: Impaired, Dysdiadochokinesia: Present
Gait examination	Requires support to stand and walk
Functional assessment tools	Trunk control test Berg balance test Nine hole peg test Barthel index
investigations	**Electrophysiology:** Facial nerve conduction and blink reflexes were normal. Repetitive nerve stimulation showed a decremental response. Motor studies revealed prolonged distal and F-wave latencies with normal CMAPs and conduction velocities (median, peroneal, tibial nerves); ulnar motor and all sensory studies were normal.
Clinical diagnosis	Miller fisher syndrome

Physiotherapy intervention:

The physiotherapy intervention was done in three phases. In the **cognitive phase**, treatment focused on trunk control, postural stability, and movement awareness through supported sitting and standing, weight-shifting, visually guided coordination exercises, and assisted gait initiation with continuous verbal and visual feedback. During the **associative phase**, therapy progressed to dynamic balance activities, task-

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oriented upper-limb coordination, and gait training with an assistive device, with reduced external feedback. In the **autonomous phase**, advanced balance, independent gait training, dual-task activities, and functional ADL practice were emphasized to enhance independence. This graded, task-specific approach resulted in improved balance, coordination, gait, and functional independence as per the International Classification of Functioning, Disability and Health (ICF) model of Miller fisher syndrome.

Treatment protocol:

Table2: phase wise structured physiotherapy protocol in MFS.

Phase / Duration	Rehabilitation Focus	Intervention	Dosage / Parameters
Pre-Functional Phase (Throughout rehabilitation)	Respiratory care, circulation, prevention of complications	Deep breathing exercises (diaphragmatic breathing, huffing, coughing)	5 repetitions, 5 times/day
		Lower limb elevation with passive ankle–toe movements (DVT & edema prevention)	10–15 repetitions, 2–3 sessions/day
		Position change	Every 2 hours
		Gaze stabilization and accommodation exercises	10 repetitions × 3 sets
		Active ROM exercises for upper and lower limbs	10 repetitions × 3 sets
Phase I – Cognitive Phase (Weeks 1–2)	Trunk control, postural stability, movement awareness, safety	Supported sitting balance and trunk control (anterior–posterior & lateral weight shifts)	10–15 reps × 2–3 sets
		Static standing with support (walker)	20–30 seconds × 5–6 trials
		Coordination exercises (finger–nose, heel–shin; eyes open)	10 reps × 2 sets
		Sit-to-stand training (assisted)	8–10 reps × 2 sets
		Gait initiation with support (stepping in place / short-distance walking)	5–10 minutes

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Phase / Duration	Rehabilitation Focus	Intervention	Dosage / Parameters
Phase II – Associative Phase (Weeks 3–4)	Refinement of balance, coordination, functional mobility	Dynamic standing balance (weight shifts, reaching beyond BOS)	10–12 reps × 2–3 sets
		Upper-limb dexterity training (peg board, Nine-Hole Peg-based activities)	10–15 minutes
		Power grip training (cylindrical, spherical, hook grips)	10–15 minutes
		Prehension training (coin picking, writing, bottle opening, rubber band exercises)	10–15 minutes
		Gait training with assistive device (level walking, turns, step practice)	10–15 minutes
		Functional task practice (transfers, grooming simulation, rolling, pelvic bridging, supine-to-sit, assisted standing)	5–8 task cycles
Phase III – Autonomous Phase (Weeks 5–6)	Independence, endurance, community mobility	Advanced balance training (tandem standing/walking, single-leg stance as tolerated)	30–45 seconds × 5 trials
		Dual-task training (walking while carrying objects)	5–10 minutes
		Independent gait training (even surfaces; support during turns/tandem walking)	15–20 minutes
		Functional strengthening & endurance (sit-to-stand, step-ups)	10–15 reps × 2–3 sets
	Speech training	Speech facilitation (vowel and consonant pronunciation in English and Telugu)	10–15 minutes

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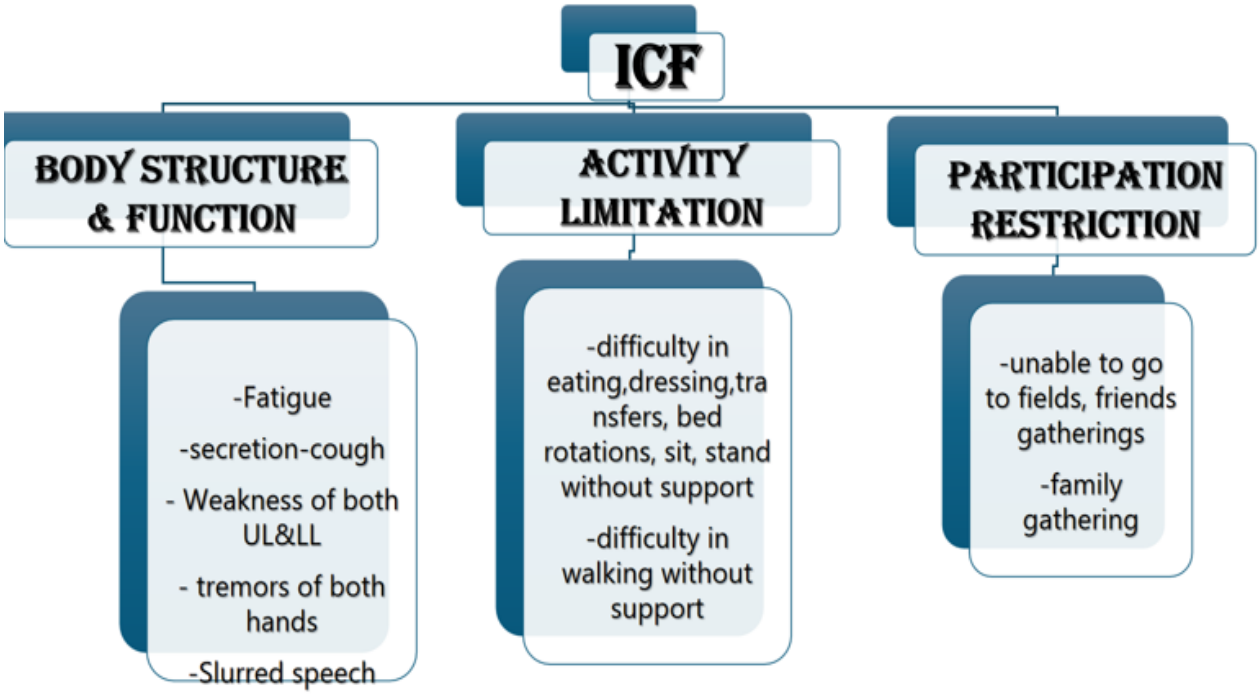
International Classification of Functioning, Disability and Health (ICF) model of Miller fisher syndrome:



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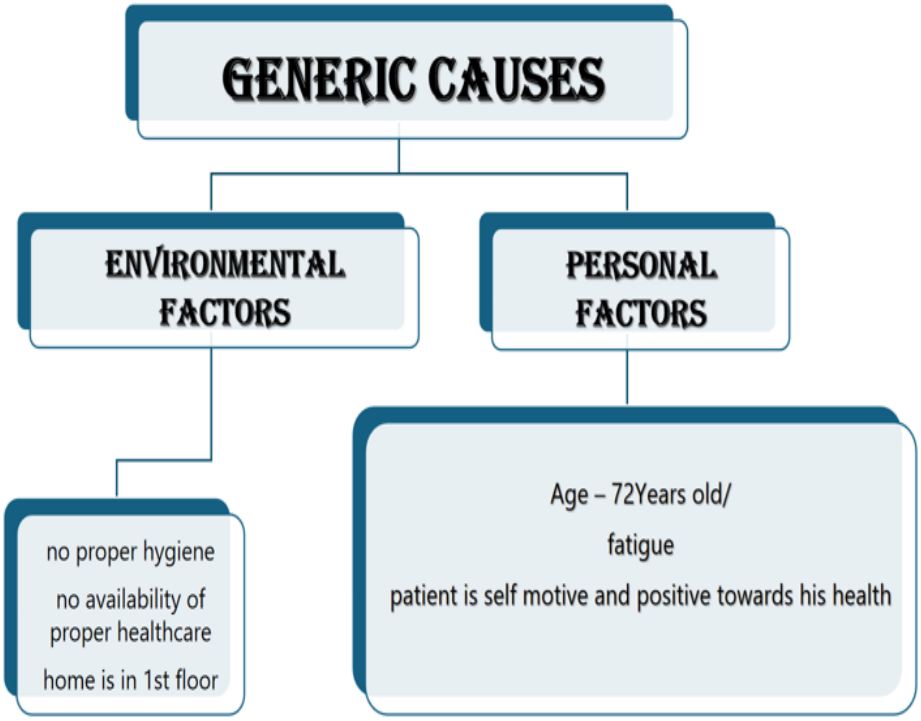

The patient underwent a 6 week physiotherapy program, comprising interventions such as balance exercises, task-oriented training, and activities of daily living (ADL) re-education and followup was done for every session .

OUTCOMES:

The patient was evaluated pre- and post-intervention using standardized outcome measures. Prior to treatment,The significant clinical improvements were observed over the 6 week rehabilitation period. The patient reported enhanced balance, coordination and independence in daily life activities.These improvements were supported by quantifiable gains in outcome measures such as Trunk control test, Berg balance scale, Nine hole peg test and Barthel index. Early initiation of physiotherapy, combined with task-specific and postural stability training, contributed to the favorable recovery.

Table 3:Pre and Post Treatment Outcome Measures:

Outcomes	Pre treatment	Post treatment	Interpretation
Trunk control test	36/100	85/100	Marked improvement in

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			trunk stability and bed mobility
Berg balance scale	18/56	46/56	Improved balance; reduced fall risk
Nine hole peg test	Right: 78seconds Left: 82 seconds	Right: 39 seconds Left: 40 seconds	Significant improvement in fine motor coordination
Barthel index	40/100	85/100	Improved independence in ADLs

Results:

Following physiotherapy intervention after 6 week protocol, the patient demonstrated significant functional improvement across all outcome measures. Trunk control improved markedly, with the Trunk Control Test score increasing from 45/100 to 85/100, indicating improved trunk stability and bed mobility. Balance performance showed substantial recovery, as evidenced by an increase in the Berg Balance Scale score from 18/56 to 46/56, reflecting reduced postural instability and a lower risk of falls. Upper-limb fine motor coordination improved considerably, with Nine-Hole Peg Test completion times decreasing from 78 to 34 seconds in the right hand and from 82 to 36 seconds in the left hand, signifying improved manual dexterity and coordination. Functional independence in activities of daily living also improved, with the Barthel Index score rising from 40/100 to 85/100, indicating a transition from moderate dependence to near independence. Overall, these results demonstrate that the structured physiotherapy intervention led to clinically meaningful improvements in balance, coordination, mobility, and functional independence in the patient with Miller Fisher syndrome.

Discussion:

Miller Fisher syndrome (MFS) is a rare immune-mediated neuropathy and a well-recognized rare variant of Guillain–Barré syndrome, classically presenting with the triad of ophthalmoplegia, ataxia, and areflexia. Although the neurological prognosis is

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generally favorable, the acute phase of the illness is often associated with significant functional impairments that affect balance, coordination, gait, and activities of daily living. The present case highlights the functional impact of MFS and demonstrates the effectiveness of structured physiotherapy rehabilitation in facilitating recovery(1,5)

The clinical presentation in this patient, including ophthalmoplegia, gait ataxia, impaired deep sensation, and absent deep tendon reflexes, is consistent with previously reported descriptions of MFS. Studies have shown that ataxia and postural instability are among the most disabling features of MFS that are frequently responsible for dependence and increased fall risk during the early stages of the disease as described by Overell & Willison, 2005; Willison et al., 2016. Preserved cognitive status, as evidenced by normal Glasgow Coma Scale and Mini-Mental State Examination scores in this patient, further supports the peripheral nature of the disorder and allows active participation in rehabilitation.(2,3)

Electrophysiological findings in the present case revealed prolonged distal and F-wave latencies with normal sensory nerve action potentials and a decremental response on repetitive nerve stimulation. Similar neurophysiological patterns have been described in MFS, reflecting proximal demyelination and neuromuscular transmission abnormalities, while sensory fibers are often relatively spared as seen in studies by Kuwabara et al., 2001; Uncini & Kuwabara, 2018. These findings help explain the prominent motor incoordination and postural instability observed clinically.(4,5)

At baseline, the patient demonstrated poor trunk control, impaired balance, reduced hand dexterity, and moderate dependence in activities of daily living. Following physiotherapy intervention, substantial improvements were observed across all outcome measures. Trunk Control Test scores improved from 45/100 to 85/100, indicating increased proximal stability and improved bed mobility. Trunk control is a key determinant of balance and functional mobility, and previous studies in neurological rehabilitation have emphasized that early trunk-focused training contributes significantly to functional recovery as seen in the studies by Verheyden et al., 2007.(7)

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Balance performance, assessed using the Berg Balance Scale, improved from 18/56 to 46/56. Balance impairment in MFS is primarily attributed to sensory ataxia and disrupted proprioceptive input. Evidence from rehabilitation studies in Guillain–Barré syndrome suggests that task-specific balance training and progressive reduction of external support can effectively improve postural control and gait stability (Khan et al., 2010; Leonard et al., 2020). The balance gains observed in this case are consistent with these findings.(6,8)

Upper-limb fine motor function showed marked improvement, with Nine-Hole Peg Test completion times reducing substantially for both hands. Dexterity impairments in MFS are often secondary to incoordination rather than weakness. Repetitive, goal-oriented hand training with peg board and other hand exercises has been shown to promote motor relearning and improve functional hand use through neural adaptation and improved motor planning as comcluded by Shumway-Cook & Woollacott, 2017. The improvements observed in this patient support the effectiveness of task-oriented upper-limb rehabilitation in peripheral neuropathies.(1,9)

Functional independence improved considerably, with the Barthel Index score increasing from 40/100 to 85/100, indicating a transition from moderate dependence to near independence. This improvement reflects gains in transfers, ambulation, and self-care activities. Although spontaneous neurological recovery is common in MFS, several authors have emphasized that functional recovery does not always parallel neurological recovery and that rehabilitation plays a critical role in optimizing independence and quality of life (Bernsen et al., 2000; Khan et al., 2010).(6,11)

The physiotherapy program in this case was structured according to Fitts and Posner’s motor learning principles, emphasizing task-specific practice, graded progression, and reduced reliance on external feedback over time. Motor learning–based rehabilitation has been widely recommended in neurological conditions to enhance skill acquisition and long-term retention of functional abilities (Fitts & Posner, 1967; Shumway-Cook & Woollacott, 2017). The positive outcomes observed in this case further support the application of these principles in the rehabilitation of patients with Miller Fisher syndrome.(9,10). This study describes the improvement using the standardised outcomes in functional recovery yet it cannot be generalized among the large populations.

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Conclusion:

The findings of this case study indicate that structured physiotherapy rehabilitation plays a vital role in improving functional outcomes in individuals with Miller Fisher syndrome. The patient demonstrated significant improvements in trunk control, balance, upper-limb coordination, and independence in activities of daily living following a task-oriented and progressive physiotherapy program. Although Miller Fisher syndrome is often associated with favorable neurological recovery, this case describes the importance of targeted rehabilitation can accelerate the functional gains and reduce residual disability. Early initiation of physiotherapy, guided by motor learning principles, may therefore be considered an essential component of multidisciplinary management in patients with Miller Fisher syndrome. Further research involving larger cohorts and long-term follow-up is required to establish evidence-based rehabilitation guidelines for this rare condition.

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