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Patient with Transverse Myelitis and Physiotherapy Management: A Case Study

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Abstract

Background: Transverse myelitis (TM) is a neurological disorder characterized by inflammation of the spinal cord, resulting in sensory, motor, and autonomic dysfunction. Individuals with TM often experience challenges with dynamic sitting balance, impacting their functional independence and quality of life. While no definitive cure exists for TM, evidence-based physiotherapy interventions have been shown to improve functional outcomes and enhance overall well-being.

Objectives: This case-based study aims to describe the evidence-based physiotherapy management for a patient diagnosed with transverse myelitis, focusing on interventions aimed at improving dynamic sitting balance. Intervention: The physiotherapy intervention consisted of a tailored program designed to address the specific impairments and functional limitations associated with TM. Key components included exercises targeting lower limb strength and flexibility, core stabilization, balance training, gait retraining, and education on assistive devices. Functional task-oriented training was also emphasized, with a focus on activities aimed at enhancing dynamic sitting balance.

Outcomes: Following a four-week intervention comprising twelve 30-minute sessions, the patient demonstrated notable improvements in mobility and balance. Specifically, the patient exhibited enhanced dynamic sitting balance, reflected in improved performance on functional tasks.

Conclusion: This evidence-based physiotherapy program highlights the potential for improving dynamic sitting balance and overall functional capacity in individuals with transverse myelitis. Regular participation in targeted interventions may help mitigate the impact of TM on daily activities and enhance quality of life.

Keywords: Transverse myelitis; Evidence-based physiotherapy; Dynamic sitting balance; Neurological rehabilitation; Functional outcomes

Background

Transverse myelitis (TM) is distinguished by localized inflammation along the spinal cord, which leads to various complications including autonomic disturbances such as bowel and bladder dysfunction and neurological dysfunction including paralysis. A higher incidence of idiopathic or secondary causes may be identified during the diagnostic process; the age distribution is bimodal. TM may present with acute or subacute onset, exhibiting a range of severity levels and prognostic factors [1].

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An uncommon spinal cord condition is transverse myelitis which is caused by inflammation and destruction to the myelin sheath of spinal cord neurons in one or more spinal segments. This disrupts nerve signal transmission, causing motor, sensory, and autonomic disorders. A specific sensory level is markedly disturbed. Infections and immune system disorders may produce idiopathic or secondary inflammation [2].

Causes of transverse myelitis can include demyelinating diseases, systemic inflammatory autoimmune disorders, neurosarcoidosis, viral infections, bacterial infections, fungal infections, parasitic infections, paraneoplastic syndromes, atopic myelitis, drugs/toxins, or can be considered idiopathic. Transverse myelitis is referred to by multiple names in the literature including myelitis, acute transverse myelitis, partial myelitis, or partial transverse myelitis. For the purpose of this case study, the term transverse myelitis will be used consistently [3]. The Transverse Myelitis Collaboration Working Group estimates that approximately 1 & 4 per million people worldwide suffer from acute TM, with peak ages of 10 to 19 and 20 to 39 years old. About 0.2 per 100,000 children get acute TM annually [4].

Calis et al. [5] in 2011 propose that the inclusion of physical rehabilitation is necessary in the treatment of TM. Nevertheless, there is a lack of comprehensive research on the physiotherapy treatment of transverse myelitis symptoms.

In a case study, Han-Hung, et al. detailed their hospital-based physical therapy treatment plan for a patient with transverse myelitis. Although the stay was brief—just five days, the group concentrated on dissecting functional actions into strengthening exercises before moving on to walking, sit-to-stand transitions, etc. Their standards for grading from strengthening to functional motions were not made public. Walking was the sole recorded functional movement during the five-day stay, and that too only on day five. To address the dearth of studies on transverse myelitis and physical therapy, this case report offers an example of a patient who tolerated early functional exercises with positive development noted.

Obtain any available published case reports regarding the use of physiotherapy in treating acute TM. These reports should focus on the positive effects of physiotherapy on various clinical and functional outcomes, including spasticity, range of motion, functional independence, ambulation, and quality of life [6].

The rationale for examining physiotherapy interventions in treating transverse myelitis (TM) is rooted in the potential to enhance patient outcomes and improve their overall quality of life. While intravenous steroids are commonly used to address acute TM, many patients still grapple with lingering deficits and functional limitations. There is still a large literature gap on the best physiotherapy management techniques specialized to the needs of each patient in the setting of transverse myelitis (TM), a rare neurological disease marked by inflammation of the spinal cord. Although many therapeutic approaches have been investigated, there are few thorough case studies that show how well particular physiotherapy protocols work to address the wide range of motor, sensory, and functional deficits linked to TM. Closing this gap will advance knowledge of customized rehabilitation strategies that maximize results and raise the standard of living for TM patients. Furthermore, with limited existing research in this area, exploring physiotherapy's impact on TM presents an opportunity to fill critical knowledge gaps and strengthen the evidence base for comprehensive TM management protocols. Ultimately, investing in physiotherapy research for TM aligns with the objective of delivering personalized, multidisciplinary care approaches tailored to the diverse needs of TM patients.

Case Assessment

Mr. X, a 65-year-old individual, came with a medical history of transverse myelitis (TM). The initial occurrence took place on December 03, 2023. He was admitted to various hospitals for medical treatment. Following the initial TM attack, he underwent medical treatment at a hospital located in Dhaka. After medical interventions, Mr. X persisted in experiencing weakness in both lower limbs and impaired sensation. Following that, to receive additional rehabilitation for enhanced functionality, he was admitted to Savar, CRP Hospital. Being a non-smoker and elderly, his medical history was further complicated by the presence of Diabetes. The three members of his family played an extremely important part in supporting him throughout his medical journey. At Savar CRP, a specialized hospital, he began a comprehensive rehabilitation program with the goal of maximizing his mobility and functional outcome.

1. **Primary concerns and symptoms of the patient:** The individual, a 65-year-old male, arrived with a sudden onset of weakness in his right upper and lower limbs, poor sitting balance and poor coordination, unable to walk and poor trunk control.
2. **Medical, family, and history along with relevant past interventions and outcomes:** The patient had a medical history marked by diabetes effectively managed with medication. No familial history of stroke or neurological ailments was identified. Past interventions involved medication compliance and lifestyle adjustments, resulting in stabilized blood pressure and cholesterol levels.
3. **Differential diagnosis:** Mr. X's medical history presenting with recurrent episodes of transverse myelitis (TM) and current complaints of diabetics, several potential differential diagnoses could be considered. These include degenerative disc disease (DDD), spinal

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cord compression, transient ischemic attack (TIA), intracerebral hemorrhage, and metabolic abnormalities like hypoglycemia. These alternative conditions must be considered during the diagnostic process to ensure accurate diagnosis and appropriate management. But the imaging and other medical conditions confirm the diagnosis of Mr. X as Transverse Myelitis.

4. **Significant physical examination and crucial clinical findings:** Upon examination, the patient displayed shoulder symmetry, trunk slouched, poor balance.

Table 1: Upper limb and lower limb functions.

Assessment area	Initial (1st Week)				Discharge (After 3 months)			
	Upper limb		Lower limb		Upper limb		Lower limb	
	Right	left	Right	Left	Right	Left	Right	Left
Muscle tone (Ashworth)	1+	0	0	0	4	3	2	3
Sensation (Thermal)	Intact	Fair	Poor	Fair	Good	Good	Fair	Good
Proprioception (Joint Sense)	Poor	Poor	Poor	Poor	Good	Good	Fair	Good
Selective movement (FIM)	Fair	Poor	Poor	Poor	Good	Fair	Good	Fair
Co-ordination (Finger to Nose Touch)	Poor	Fair	Poor	Poor	Good	Fair	Fair	Good

Table 2: Physical examination (Upper and lower limbs ROM and strength).

limb	Joint	AROM initial (1st Week)		AROM Discharge (After 3 months)		Strength initial (Oxford Grade) (1st Week)		Strength Discharge (Oxford Grade) (After 3 months)	
		Rt	Lt	Rt	Lt	Rt	Lt	Rt	Lt
Upper limb	Shoulder	↓ROM	↓ROM	Full	Full	G-2	G-2	G-4	G-4
	Elbow	↓ROM	Full	Full	Full	G-2	G-2	G-4	G-4
	Wrist	↓ROM	↓ROM	Full	Full	G-2	G-2	G-4	G-4
	Hands	↓ROM	↓ROM	Full	Full	G-3	G-3	G-4	G-5
Lower limb	Hip	↓ROM	Full	Full	Full	G-0	G-2	G-4	G-5
	Knee	↓ROM	Full	Full	Full	G-0	G-1	G-4	G-5
	Ankle	↓ROM	↓ROM	↓ROM	Full	G-1	G-2	G-3	G-5
	Feet	↓ROM	↓ROM	↓ROM	Full	G-0	G-2	G-3	G-5

Table 3: Functional test measurement.

Test	Measurement points	**Initial** (1st Week)	**Discharge** (After 3 months)	
Higher function	Starting up down	UTA	Fair	
	Fast walking	UTA	Fair	
	Running	UTA	Fair	
Mobility and balance outcome measures	10 meter walk test	Number of steps	UTA	48
		Time	UTA	9min
	6 minute walk test	Number of distances	UTA	30
		1st rest (Distance)	UTA	40
		Total distance	UTA	250
Upper limb activities		Gross grasp ability	Good	Good
		Gross release ability	Good	Good
		To hold glass, cup and pen, manage buttons, write etc.	Good	Good

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Table 4: Burg Balance test.

S/N	Item Description	Initial (1st Week)	Discharge (After 3 months)
1	Sitting to standing	0	3
2	Standing unsupported	0	3
3	Sitting unsupported	3	4
4	Standing to sitting	0	4
5	Transfer	1	3
6	Standing with eyes closed	0	3
7	Standing with feet together	0	3
8	Reaching forward with outstretched arm	4	3
9	Retrieving object from floor	4	3
10	Turning to look behind	3	3
11	Turing 360 degrees	1	3
12	Placing alternate foot on stool	0	3
13	Standing with one foot in front	0	3
14	Standing on one foot	0	3
Total		16	40

5. Diagnostic testing encompassing laboratory tests and imaging:

Lipid Profile:

- Total Cholesterol: 220 mg/dl
- LDL Cholesterol: 140 mg/dl
- HDL Cholesterol: 50 mg/dl
- Triglycerides: 180 mg/dl

Glucose Levels:

- Fasting Glucose: 110 mg/dl

Coagulation Parameters:

- Prothrombin Time (PT): 12 seconds
- International Normalized Ratio (INR): 1.1
- Partial Thromboplastin Time (PTT): 28 seconds

Imaging:

- MRI scan of the Brain:

1. Empty sella
2. Diffuse mild to moderate bilateral symmetric cerebral and cerebellar volume loss.
3. MRI of the Spine: MRI results supported the presence of low avid hypermetabolic heterogenous osteolytic bony lesion in the sacro-coccygeal bone indenting to sacral canal likely to be inflammation however malignancy could not be ruled.
4. CT scan of Spine: Diffuse generalized osteopenia of all bones with coarse trabeculae.

Figure 1: Radiology Imaging of Patient.

5. Challenges in Diagnosis: Diagnosing transverse myelitis (TM) presents challenges, particularly in regions with limited access to healthcare facilities. Patients, especially those residing in rural areas, may encounter barriers such as distance from diagnostic centers equipped with necessary imaging technology, transportation issues, and financial constraints, all of which can contribute to delays in seeking medical assistance.
6. Prognosis: While early intervention and rehabilitation efforts may improve functional outcomes for TM patients, there remains the possibility of residual deficits and disability. Continued monitoring and therapy are essential to assess progress and optimize the patient's trajectory towards recovery.

7. Therapeutic Interventions:

Physiotherapy Management (Table 5):

Table 5: Physiotherapy Management.

Therapeutic Intervention	Dosage/ Strength	Duration	Outcome measurement
Range of Motion Exercises	10 repetitions per joint	15 minutes/ session	Goniometer
Strength Training	60-80% of 1RM	3 times/ week	Oxford Grade Scale
Gait Training	Initially 50 meters, progressing to 200 meters	20 minutes/ session, 5 times/week	6min walk test & 10 meter walk test
Balance and Coordination Exercises	Progressively increasing difficulty based on patient tolerance, focusing on seated balance exercises	15 repetitions/ exercise, 10-15 minutes/ session	Berg Balance Scale, Finger to nose and Heel to shin touch

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Functional Training	Transfer from bed to chair, reaching for objects while maintaining seated balance	5-10 repetitions/ task, 30 minutes/ session	FIM Scale
Task-Specific Practice	Writing, dressing, using utensils while maintaining seated balance	10 repetitions/ task, 20 minutes/ session	Berg Balance Scale
Neuromuscular Reeducation	Proprioceptive Neuromuscular Facilitation (PNF), Bobath Technique emphasizing seated balance control	15 repetitions/ technique, 15-20 minutes/ session	FIM Scale

Medication:

- Antithrombotic Therapy
- Thrombolytic Therapy
- Antiplatelet Agents
- Anticoagulants
- Statins
- Antihypertensive Medications
- Anticonvulsants

9. **Administration of Therapeutic Interventions:** Therapeutic interventions involve specific dosages, strengths, and durations tailored to the patient's condition. For example, range of motion exercises may require twice daily sessions with 10 repetitions per joint for 15 minutes per session.
10. **Changes in Therapeutic Interventions:** Therapeutic approaches are adjusted based on ongoing evaluation of the patient's response and progression. Modifications in medication dosage or frequency aim to optimize efficacy while minimizing adverse effects.
11. **Clinician and Patient-Assessed Outcomes:** Clinician-assessed improvements include enhancements in motor function, speech clarity, and daily activity performance. Patient-reported outcomes may include perceived improvements in mobility, independence, and overall quality of life.
12. **Follow-Up Diagnostics:** Follow-up diagnostic tests, such as MRI or CT scans, are conducted to monitor changes in the size or extent of the lesion. Regular laboratory tests track parameters like lipid levels and glucose control.
13. **Assessment of Intervention Adherence and Tolerability:** Adherence to therapeutic regimens is monitored through follow-up appointments and communication with patients and caregivers. Tolerability of medications and therapies is assessed based on patient-reported side effects and clinical evaluations, with adverse events documented and managed accordingly.

Figure 2: Physiotherapy Interventions.

Discussion

Transverse myelitis (TM) encompasses a diverse range of inflammatory conditions affecting the spinal cord, resulting in varied motor, sensory, and autonomic impairments. Possible causes include demyelination, infections, autoimmune reactions, and cryptogenic factors. This wide spectrum of potential origins often overlaps with non-inflammatory spinal cord disorders, posing considerable diagnostic and therapeutic challenges for clinicians and leading to delays in effective management. Furthermore, the scarcity of longitudinal studies, particularly outside specialized centers, hinders comprehensive understanding of TM. Recent investigations into TM prevalence in the United States have been limited. A study spanning 1960 to 1990 in New Mexico identified 33 cases, estimating an annual incidence rate of 4.6 per 1,000,000 individuals. Another study in Olmsted County, Minnesota, reported a prevalence of idiopathic acute TM at 7.9 cases per 100,000 individuals between 2003 and 2016. International data from Israel and the United Arab Emirates indicated TM prevalences of 1.34 and 0.18 cases per 1,000,000 individuals per year, respectively [7].

Common additional symptoms experienced by TM patients include sexual dysfunction, increased bladder and bowel incontinence, spasticity, fatigue, and depression. Literature

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indicates diverse recovery patterns following TM diagnosis, ranging from minimal to minor symptoms, moderate levels of permanent disability, to no recovery resulting in severe functional impairment. While rehabilitation following any spinal cord injury generally enhances functional outcomes, TM presents unique challenges that may hinder participation in rehabilitation efforts. Despite the recognized benefits of physical therapy (PT) interventions, there remains a paucity of research detailing specific PT approaches tailored for TM patients. This case study sheds light on the diagnostic process, treatment modalities, and outcomes experienced by a 44-year-old male living with TM, who has adjusted to an alternative lifestyle alongside his family due to his condition [8].

Correct positioning of the lower back and pelvis, achieved by placing a firm pillow beneath the thighs while the patient was lying supine, successfully alleviated the patient's low back and gluteal pain within three days (verbal pain rating scale 0). However, to prevent recurrence of pain, the patient was advised to maintain this supine lying position throughout their admission. After five days, cryotherapy and gentle stroking techniques were implemented to decrease the frequency and intensity of muscle spasms, resulting in the cessation of spasms in the right lower limb and a reduction in the frequency (less than one every 30 minutes) and intensity of spasms in the left lower limb. Subsequently, additional interventions were introduced to address medium-term goals. Soft tissue mobilization techniques, including kneading and wringing, along with sustained gentle passive stretches, were introduced after five days to normalize muscle tone [9]. These interventions were combined with previous strategies of proper positioning, cryotherapy, and gentle stroking. Following three days of combined interventions, the patient's muscle tone decreased significantly. Evaluation using the modified Ashworth scale revealed a score of 0 for the right lower limb, 1+ for the left hip, and 3 for the left knee and ankle. Consequently, the patient achieved full active range of movement in all joints of the right lower limb without difficulty. In the left hip, active mid-range movement and full passive movement were attained [10,11]. However, only a limited active range (approximately 20°) was achieved in the left knee and ankle joints, whereas full passive movement was possible with considerable difficulty. Additionally, the patient reported a reduction in the sensation of shock below the T12 level from 8/10 to 3/10 on the verbal rating scale [1].

Informed Consent: Did the patient give informed consent? Please provide if requested: Yes, the patient provided informed consent for the treatment received.

Conclusion

In summary, transverse myelitis (TM) presents with various symptoms, including muscle weakness, sensory deficits, and pain, which significantly affect the patient's well-being. Effective management involves a multidisciplinary approach, incorporating physical therapy interventions tailored to address specific symptoms and promote recovery. This case illustrates the efficacy of interventions such as appropriate positioning, cryotherapy, and gentle stretching in alleviating discomfort and reducing muscle spasms. Despite the challenges associated with TM, the patient's perspective reflects resilience and optimism for improvement. Going forward, ongoing research and exploration of therapeutic strategies are essential to enhance outcomes and support individuals affected by TM. Ultimately, a comprehensive and patient-centered approach is vital for optimizing care and enhancing the quality of life for TM patients.

Patient Perspective: Patients appreciated how physiotherapy changed their lives when they commented. They might discuss how the physiotherapist personalized the exercises and other treatments to meet their needs and problems. The supportive and encouraging environment during therapy may have also helped them solve their problems and progress. The patient's feedback would likely emphasize how the physiotherapy treatment improved their mobility, strength, and health, emphasizing its importance in their recovery and independence.

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