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# Targeted Physiotherapy Program for a Patient with Sellar- Space Occupying Lesion and Sensory Ganglionopathy

Dhanusia S*, Jayasree Sai. L, Vanitha Jayaraj, Karthika Ramalingam, Andrew Anbarason J. P.
*Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India*

***Abstract***

*Complex neurological conditions challenge the rehabilitation process. Sellar space-occupying lesions, mainly pituitary adenomas, may affect neurovascular structures, causing visual disturbances, hormonal imbalance, and neurological deficits. Sensory ganglionopathy is a rare peripheral nervous system disorder which causes proprioceptive deficits and impaired coordination. A 25-year-old male was diagnosed with Sellar space occupying lesion and sensory ganglionopathy, experienced impaired balance and coordination due to sensory deficits. These impairments led to limitations in the functional independence of the patient. A targeted physiotherapy program was implemented to address the multifaceted needs of the patient, incorporating strategies such as proprioceptive training, balance training, coordination exercises, strength training, sensory re-education, and patient education. The session was conducted for 45–50 minutes, five times a week for a total duration of 6 weeks. Pre-and post-test assessments was taken using the Berg Balance Scale, the Scale for the Assessment Rating of Ataxia, Romberg's test and the Functional Independence Measure. The patient demonstrated notable improvement in the outcome measures. The study concluded that the targeted physiotherapy approach significantly improved balance, coordination, proprioception and functional independence in a patient with a seller space-occupying lesion and sensory ganglionopathy.*

***Keywords:*** *Incoordination, Proprioceptive Training, Romberg's Test, SARA, Sensory Ganglionopathy.*

## Introduction

Sella turcica is a region in the sphenoid bone of the middle cranial fossa. It is a complex anatomical area comprising of various neurovascular structures within a small space. This region houses the pituitary gland with adenohypophysis and neurohypophysis [1]. This small space is susceptible to space occupying lesion which may be primary (e.g., pituitary adenomas) or secondary from surrounding structures [2]. The most common are the pituitary adenomas constituting approximately 10-15% of all intracranial neoplasms [3]. Pituitary adenomas are categorized based on size into microadenomas (<10 mm), macroadenomas (>10 mm), and giant adenomas (>40 mm). Additionally, pituitary adenomas are also categorized based on function as functioning adenomas which secrete excess hormones, while nonfunctioning adenomas do not release hormones, but can compress adjacent structures. These lesions can cause visual disturbances, hormonal imbalance and neurological deficits [4]. The diagnostic evaluation includes testing for serum autoantibodies which are antinuclear, anti-Ro, and anti-La antibodies in case of paraneoplastic tumours. Diagnostic imaging techniques such as magnetic resonance imaging and computed tomography scans are indispensable tools for diagnosing tumors [5,6].

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****Corresponding Author: dhanusiasuresh1798@gmail.com***

Sensory ganglionopathy is a rare condition characterised by degeneration of sensory neurons of the dorsal root ganglion. The sensory ganglia are located next to spinal cord and contain sensory nerve cell bodies with extensions connecting to the spinal cord and peripheral nerves [7]. These ganglionopathies are linked to medical disorders from paraneoplastic syndromes, autoimmune disorders, or genetic factors, and are vulnerable to autoimmune attacks. Paraneoplastic sensory ganglionopathy arises from cytotoxic T cells triggered by tumour antigens which leads to neuron loss, CD8 T-cell infiltration, and reduced myelinated fibers. This causes clinical features that are distinct from typical peripheral neuropathies [8].

Sensory ganglionopathy selectively affects sensory neurons, predominantly involving large nerve fibers. This leads to impaired touch, proprioception and vibration sensation, along with ataxia, while muscle strength remains preserved. It also associated with pseudo-athetoid posturing which indicates a search for spatial positioning along with Romberg's sign and loss of tendon reflexes [9]. Sensory ataxia in sensory ganglionopathy is characterized by unsteadiness and impaired coordination due to disruption of sensory pathways involving the posterior spinal roots which simulates cerebellar disease [10]. Sensory and motor nerve conduction studies are recommended to assess demyelinating or axonal physiology, with findings often indicative of axonal and purely sensory involvement in large-fibre sensory ganglionopathy. In contrast, findings may be normal in small-fiber cases. Additionally, cerebrospinal fluid analysis should also be considered [11].

Patients with sellar space-occupying lesions and sensory ganglionopathy experience visual, hormonal, sensory impairments, and ataxia. Standardized assessment tools are essential for evaluating and monitoring patient progress in clinical research and practice which includes Scale for the Assessment and Rating of Ataxia (SARA) used to assess ataxia severity, Berg Balance Scale (BBS) evaluates static and dynamic balance, Romberg's test for assessing dorsal column integrity, particularly in patients with ataxia and Functional Independence Measure (FIM) offers a validated and objective evaluation of functional status [12-15].

Complex neurological conditions challenges rehabilitation of the patient, emphasizing the need for a targeted, multidisciplinary approach. Developing an effective physiotherapy program to address the diverse needs is particularly challenging due to the limited guidelines available for dual diagnoses [16]. Physiotherapy plays a crucial role in addressing these impairments by incorporating a targeted and multimodal approach with strategies like proprioceptive, coordination, and functional training to improve balance, coordination, and quality of life [17].

This case report aims to determine the effectiveness of a targeted physiotherapy program on balance, coordination, proprioception and functional independence in a patient with a seller-space occupying lesion and sensory ganglionopathy, focusing on identifying and addressing specific impairments and offering insights for similar clinical profiles.

## Case Report

A male patient with 25 years of age presented to the hospital reporting complaints of loss of sensations, unsteadiness while walking along with visual disturbance persisting for the past one week. He had no known comorbidities or personal habits. The patient was diagnosed with a Sellar space-occupying lesion and sensory ganglionopathy, confirmed through magnetic resonance imaging (MRI) and nerve conduction studies. MRI revealed the presence of a pituitary macroadenoma, while nerve conduction studies demonstrated absent sensory nerve action potentials (SNAP) in the bilateral sural, median, and ulnar nerves, indicative of pure sensory axonal polyneuropathy involving both upper and lower limbs. The laboratory investigations revealed low vitamin-D (15.7). The serum antibody workup for dsDNA, P-ANCA, C-ANCA, and ANA was negative. Hormonal analysis revealed elevated levels of LH (1.17), FSH (3.05), and prolactin (>329.0) with thyroid function tests indicating increased levels of T3 (3.41), T4 (1.13), and TSH (5.216). Hematological evaluation indicated normocytic normochromic anemia, with a peripheral blood smear showing neutrophilic leucocytosis and thrombocytosis.

On physiotherapy examination, He had a Glasgow coma scale (GCS) score of 15/15 and was conscious and oriented to time, place and person. Sensory evaluation revealed an absence of touch, joint position sense, and vibration sense. Muscle tone was normal with muscle strength graded as 4/5 in bilateral upper and lower limbs. All the deep tendon reflexes were graded as 1+. Coordination assessment revealed grade 3 incoordination on equilibrium testing and grade 2 incoordination on non-equilibrium testing along with positive Romberg's test. Balance and gait evaluation revealed impaired standing balance with wide base of support, increased double-limb support time, and bilateral knee hyperextension during the stance phase, indicating significant challenges in coordination and balance. The patient was managed conservatively with medications and physiotherapy during his hospital stay. Systematic and tailored interventions were incorporated based on a comprehensive assessment of his specific needs and addressing coordination and balance.

This study received approval from the Institutional Ethics Committee for Human Research under the protocol number 09/07/2024/ISRB/FR/SCPT. The procedure was clearly explained and subject provided informed consent for the treatment maintaining confidentiality. The pre-test assessment involved administering the Berg Balance Scale (BBS), Romberg's test, Scale for the Assessment and Rating of Ataxia (SARA), and the Functional Independence Measure (FIM). The pre- test scores revealed, Berg Balance Scale (BBS) score of 25, a positive Romberg's test, Functional Independence Measure (FIM) score of 69 and Scale for the Assessment and Rating of Ataxia (SARA) score of 24.

A six- week targeted physiotherapy program was designed and implemented to the patient. The program incorporated the following interventions:

**Proprioceptive and Balance Training (Figure 1)**

The intervention consisted of structured program incorporating weight-bearing exercises and kinesiology taping. Kinesiology tape was applied to the soles of both feet on alternate days to enhance proprioceptive feedback. The weight-bearing exercises were performed on progressively challenging surfaces, such as foam pads, balance boards, and unstable platforms, to stimulate adaptive postural responses. Additionally, dynamic balance tasks were performed to further enhance stability and functional movement control. The activity included:

Dynamic sitting activity: The patient was positioned in a high sitting and asked to hit the balloon using a wand, held with both hands. The activity was later progressed to being performed while seated on a Swiss ball.

Sit to stand activity: Patient was instructed to perform sit to stand from chair and asked to catch the ball while on standing. This activity was later progressed to performing sit to stand while catching a ball from multiple directions.

Static standing: Patient was instructed to maintain standing position while holding a ball with both hands. This activity was progressed to performing the task with eyes closed.

Stepping activity with TheraBand resistance: The patient was instructed perform forward and backward stepping on wide 6-inch stool with TheraBand resistance. This activity was progressed to performing the activity on foam board.

Spot marching: The patient initially performed marching on even surface within parallel bars. This activity was progressed to performing task with eyes closed.

Mini wall squats: The Patient was instructed performed mini squats. Later this activity was progressed with maintaining a squat position while holding a one kg medicine ball.

Walking: the patient was instructed to walk on treadmill at a speed of 1mph. This activity was progressed inclined walking on treadmill.

**Figure1.** Proprioceptive Training

### Coordination Training

Building blocks activity: The patient was instructed to construct a building using building blocks.

Foot placement on floor tracings: the patient was made to perform this activity in sitting as well as standing positions. Initially it was performed with one leg and progressed to alternate legs and with altering speeds.

Alternate ball kicking: The patient was instructed to perform the activity in sitting and was instructed to kick the ball using the leg specified by the therapist.

Alternate stepping on stool: The patient was asked to perform alternate stepping on a 6-inch-high stool and progression was made by altering the height of the stool.

Tandem walking: The patient was asked to walk with heel of one foot touching the toes of other foot. This activity was later progressed to holding a wand while walking.

Obstacle crossing: Patient was instructed to cross the cones placed straight on the floor.

Sideward and backward walking: The patient was asked to perform sideward and backward walking in parallel bar.

### Strengthening Exercises

The patient was instructed to perform upper limb and lower limb strengthening exercises with weight cuffs. Core strengthening exercises were also incorporated which included bird dog and abdominals crunches.

### Sensory Re-Education for Bilateral Upper Limb and Lower Limbs

The patient was given stroking with different textures ranging from soft brushes to hard fabric along with vibratory stimulation using a portable mini vibrator. Additionally, proprioceptive task involving identification of position of limbs while keeping eyes closed was performed.

**Patient Education**

Patient education was provided, emphasizing on foot care and injury prevention. This included recommendations to avoid bare foot walking, maintain regular foot hygiene, inspect feet for skin breaks, apply appropriate wound dressings if needed, wear non slip socks and use properly fitted, supportive footwear.

The patient underwent a targeted physiotherapy program for 45–50 minutes per session, five days a week for six weeks, with a 2-minute rest period between activities. Exercises were progressively adjusted based on the patient's capacity.

## Results

Following six weeks of training, the patient showed significant improvement in the assessed outcome measures. Pre and post-test outcome measure findings are detailed in Table1.

**Table 1.** Assessment of Outcome Measures Pre & Post Physiotherapy Intervention

| Outcome Measure | Pre-Intervention Score | Post-Intervention Score |
|---|---|---|
| Berg Balance Scale (BBS) | 25 | 40 |
| Functional Independence Measure (FIM) | 69 | 95 |
| Scale for the Assessment and Rating of Ataxia (SARA) | 24 | 19 |
| Romberg's test | POSITIVE | NEGATIVE |

## Discussion

Rehabilitating patients with complex neurological conditions presents a distinctive challenge due multifaceted impairments affecting the overall functional independence. This case report showcases the efficacy of targeted physiotherapy program on balance, coordination, proprioception and functional independence in a patient with a seller-space occupying lesion and sensory ganglionopathy. By integrating proprioceptive training, balance training, coordination exercises, strength training, sensory re-education, and patient education, the program significantly contributed in improving the outcomes measures as measured by standardized scales. The findings from this case align with existing literature, reinforcing the value of targeted physiotherapy in neurological rehabilitation for similar clinical profiles.

The importance of early and focused rehabilitation is underscored by studies on cerebellar ataxia following brainstem encephalitis. One study reported that targeted physiotherapy approach, incorporating task-specific exercises, resistance training, gait training, and coordination drills, led to substantial improvements in functional status and quality of life [18]. These findings are consistent with this case study, where targeted interventions addressed the patient's unique neurological impairments, hence enhancing the functional independence of the patient.

Additionally, a systematic review on rehabilitation interventions for individuals with genetic degenerative ataxia highlights the effectiveness of rehabilitation in improving ataxia symptoms, gait, and balance. This review emphasizes the significance of long-term rehabilitation duration and optimal intensity to sustain functional gains [19]. The findings of this study resonate with these insights, comprehensive and sustained therapy is crucial for achieving lasting improvements.

Furthermore, a recent meta-analysis concluded that personalized dual-task training combined with proprioceptive interventions significantly enhances balance, motor control, and gait automation [20]. This aligns with the proprioceptive training component incorporated in the study, reaffirming the role of sensory integration exercises in enhancing motor function.

Moreover, a study focusing on patients with cerebellopontine angle tumors showed that a multidisciplinary physiotherapy approach improves balance and coordination by integrating different therapeutic interventions [21]. Similarly, research on Acute motor and sensory axonal neuropathy highlights the importance of individualised physiotherapy programs in enhancing functional recovery [22]. These studies reinforce the principles applied in this study, emphasizing the need for tailored, patient-centric physiotherapy strategies.

Proprioceptive training, in particular, has been extensively studied for its impact on balance improvements. Research suggests that longer training durations of 6–12 weeks yield superior results compared to shorter programs of approximately three weeks [23-25].

The success of targeted physiotherapy program depends not only on improving the outcome measures but instead involves in improving stability during daily activities, enhancing confidence, and functional independence underscores its potential applicability to similar neurological cases. However, this case report has its limitations, as it is based on a single patient. While the observed improvements are promising, further research with larger cohorts is necessary to validate these findings. Future studies should integrate emerging technologies, such as virtual reality-based balance training and wearable biofeedback devices, to enhance rehabilitation outcomes and ensure the long-term sustainability of functional gains in patients with complex neurological disorders.

## Conclusion

The study concluded that the targeted physiotherapy approach significantly improved on balance, coordination, proprioception and functional independence in a patient with a seller-space occupying lesion and sensory ganglionopathy. Future studies should also explore long-term effects and individualized treatment strategies to optimize patient recovery.

## Conflict of Interest

Nil.

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