Heighten Science PUBLICATIONS Corporation

ISSN
2573-6264

Case Report

Physical Therapy for Transverse Myelitis: A Case Report

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Submitted: 16 December 2017
Approved: 06 January 2018
Published: 08 January 2018

Keywords: Transverse Myelitis; Physical Therapy; Fatigue; Exercise

Abstract

Background and Purpose: Transverse myelitis (TM) is a rare neurological diagnosis found in 1-4 per million people. Rehabilitation is recommended secondary to steroid treatment. There is limited clinical research on physical therapy (PT) for TM. The purpose of this case report is to present PT examination and management strategies for a patient with TM.

Case Description: A 25-year-old female patient diagnosed with TM was referred to PT. She presented foot drop causing ataxic gait, decreased sensation in bilateral lower extremities, significant fatigue, and low back pain. The patient required significant rest time between all tests and measures due to severely increased fatigue. PT plan of care was focused on therapeutic exercises per patient tolerance, passive range of motion (ROM) administered by the therapist, and gait training when activity tolerance was increased.

Outcomes: The patient was able to tolerate bouts of exercise as prescribed through home exercise program. She responded very well to passive ROM treatment during breaks between exercises to maintain ROM and decrease rigidity. Active ROM exercise was used to build activity tolerance while being mindful of limited ability due to fatigue. Upon increased activity tolerance, the patient was able to tolerate gait training with multiple breaks and maintain corrected gait when addressed during treatment.

Discussion: PT intervention was helpful for this patient with TM. Breaking down functional activities based on patient tolerance is important when treating people with TM. More experimental research is needed to support the benefits of PT for TM.

Introduction

Transverse myelitis (TM) is a neurological pathology involving inflammation or lesions on the spinal cord, for which onset of symptoms is rapid and progressive, consisting of back pain, signs of spinal shock, areflexia, flaccidity, abnormal somatosensory evoked potentials, abnormal imaging, and a high deficit score at onset [1,2]. The incidence is 1-4 per million people with peak rates from 10-19 years and 30-39 years without specific etiology [2]. Standard treatment is intravenous steroid [3,4]. The prognosis ranges from patient to patient, with approximately one third demonstrating complete recovery, one third demonstrate mild residual deficits, and the remaining third remain severely disabled [2,5]. Rehabilitation has been suggested for the management of TM [1,6]. However, there is limited clinical research on physical therapy (PT) for patients diagnosed with TM.

Case Description

The patient was a 25-year-old female with a previous medical history of Hodgkin's lymphoma for which she received chemotherapy and radiation therapy eight years prior to onset of her current TM diagnosis. Her diagnosis of Hodgkin's lymphoma was resolved with no red flags indicating current issues at the time of PT evaluation and treatment. She was admitted to the hospital for five days due to sudden onset of

How to cite this article: Buchanan A, Wilkerson KJ, Huang HH. Physical Therapy for Transverse Myelitis: A Case Report. J Nov Physiother Rehabil. 2018; 2: 015-021. https://doi.org/10.29328/journal.jnpr.1001017

lower extremity (LE) numbness and tingling. Upon release from the hospital, she was using a rolling walker to ambulate and referred to therapy after imaging (MRI and CT) confirmed a diagnosis of TM with visible lesions on her spinal cord. The patient was referred to PT for three times per week for two weeks. Her primary complaints included tingling, numbness, and weakness in bilateral anterior LE and left thigh posteriorly down to her toes, with intensity greater on her right LE than the left LE. She also presented the same symptoms on the right side of her abdomen. In addition, the patient complained of pain in her left lower back when sleeping in a supine position, and the low back pain affected her walking ability. All the symptoms were progressively worsening over time. The patient was placed on Prednisone to address the TM and took Tylenol to address back pain as necessary.

Examination

Prior to arriving at the outpatient PT clinic, the patient was admitted to the hospital and released shortly afterward. While admitted, a neurological screen was performed, with findings that matched what was found in the PT clinic. It was noted in the hospital's documentation that the patient was unable to identify hot/cold sensation on her feet, but did not specify if any other sensation testing was performed or what the results were. CT without contrast was performed on the patient's head which was unremarkable, and the thoracic and lumbar spinal CT was also unremarkable. An MRI was performed on the brain with no lesions or plaques identified. An MRI with and without contrast was also performed on the thoracic spine, showing inflammation in the upper aspect of the spinal cord at T4-5 and T6-7 levels most prominently. The report noted that they "could not exclude potential for inflammatory changes" due to the nature of TM. Laboratory findings were unremarkable with the exception of the patient having an increased white blood cell count.

During the examination at the PT clinic, patient fatigued very easily which might have been due to the nature of TM. Therefore, all exams required some modifications to allow the patient to conserve energy. The exams were focused on range of motion (ROM), muscle strength, functional assessments, pain, and gait. The LE ROM is summarized in table 1. The upper extremity (UE) ROM was within functional limits (WFL) in all tested planes. The UE and LE muscle strength is summarized in table 2.

Table 1: Lower Extremity ROM.

	Right	Left
Hip Flexion	WFL	WFL
Knee Flexion	WFL	WFL
Knee Extension	WFL	WFL
Ankle Dorsiflexion	0~5°	0~10°
Ankle Pronation	WFL	WFL
Ankle Supination	-10°~0°	WFL

WFL: Within functional limits

Table 2: Upper and Lower Extremities Strength.

	Right	Left
Shoulder Flexion	5/5	5/5
Shoulder Extension	5/5	5/5
Shoulder Abduction	5/5	5/5
Elbow Flexion	5/5	5/5
Elbow Extension	5/5	5/5
Wrist Flexion	4+/5	4+/5
Wrist Extension	5/5	5/5
Grip	5/5	5/5
Hip Flexion	3/5	4/5
Knee Flexion	4-/5	4+/5
Knee Extension	4-/5	5/5
Ankle Dorsiflexion	4/5	5/5
Ankle Pronation	4/5	5/5
Ankle Supination	3-/5	3+/5

The results of muscle strength assessment suggested that the patient had weakness on bilateral lower extremities, with greater weakness in the right than the left. This decrease in strength resulted in reduced functional ability for the patient to perform activities of daily living (ADLs) including walking and transfers. Based on the subjective information by the patient during the initial evaluation detailing numbness and tingling from the right side of her abdomen to her toes and left hip to toes, a gross light touch sensory test was performed. There was no evidence suggesting complete paraplegia, although the patient presented with foot drop and decreased sensation on the right side. The patient did not present with urinary retention or fecal incontinence. The patient demonstrated difficulty using a rolling walker to ambulate into the clinic due to her increased fatigability. Sit-to-stand transfers from a chair were modified independent as the patient required use of an assistive device. Based on the Numeric Pain Rating Scale (NRS) [7], the patient rated her low back pain 4/10 and LE pain 0/10. The patient presented with gait deviations including decreased toe-off bilaterally during gait, right-sided foot drop, ambulation with a wide base of support, locking the right knee into terminal knee extension resulting in ataxic gait, with the right side showing more deviations than the left, and significant decrease in endurance with gait. In addition, the patient completed a Lower Extremity Functional Scale (LEFS) [8] with score of 13/80. Upon the patient's fourth visit, the patient performed a Timed Up and Go (TUG) Test [9], 30-Second Chair Stand Test [10], and completed an Oswestry Low Back Pain Disability Questionnaire [11]. The prognosis for this patient was fair. Given the nature of TM, progression to plateau of symptoms and recovery is unknown and different for each patient [4,5,12].

Intervention

The primary goal of PT intervention was to improve functional movement and mobility [13], while keeping in mind the level of fatigue that the patient was experiencing and able to tolerate during each treatment session. The energy conservation techniques were emphasized as the literature is unclear on plateau and/or progression of TM symptoms [4].

Therapeutic exercises were given as part of the patient's home exercise program (Table 3), and each exercise was performed per patient tolerance. Therapeutic exercises consisted of seated heel raises, toe raises, abdominal (TA) marching, short arc quads (progressed to long arc quads, then progressed to long arc quads with 0.5 pound ankle weight), bridging, ankle alphabet in sitting or supine, supine hip abduction, and BAPS with right and left ankles (clockwise and counter-clockwise). Joint mobilizations were performed at the knee to restore mobility and decrease pain after tightness/stiffness present in knee that caused increased deficits with antalgic gait. Grade 1-2 joint mobilizations consisted of distraction followed by posterior glides at the tibial-femoral joint with the patient supine and knee flexed to approximately 25 degrees, applying force posteriorly to increase knee flexion [14].

Starting at the third treatment session, the therapist incorporated passive ROM (hip flexion, hip extension to neutral, knee flexion, knee extension, ankle dorsiflexion, plantarflexion, inversion, eversion) into the exercise program. The therapist performed all passive ROM in supine and sitting during breaks after patient performed active ROM exercises. Using passive ROM during breaks between active exercises maximized the time the patient required to conserve energy. Gait training was performed during the last therapy session as the patient build exercise endurance over the course of treatment. Progression of gait training is specified in table 4. No assistive devices were utilized during gait training. In addition, the patient was educated in proper sleeping support using pillows under her knees to alleviate low back pain, and proper shoe wear in attempt to correct mechanics of gait and protect the feet.

Table 3: Home Exercise Programs (HEP).

Visit	HEP	Duration
1	• Energy conservation education • Seated heel raises • Seated toe raises • Long arc quads • Supine abdominal (TA) marching	All exercises to tolerance
2	• Energy conservation education • Seated heel raises • Seated toe raises • Long arc quads • Supine abdominal (TA) marching	All exercises to tolerance
3	• Energy conservation education • Seated heel raises • Seated toe raises • Long arc quads • Supine abdominal (TA) marching • Ankle alphabet in supine x1 bilaterally • Supine hip abduction x5 bilaterally • (+) Hip, knee, and ankle PROM flexion/extension x5 bilaterally during breaks	All exercises to tolerance Except: • Ankle alphabet • Supine hip abduction • PROM
4	• Seated heel raises • Seated toe raises • Long arc quads • Supine abdominal (TA) marching • Ankle alphabet x1 bilaterally • (+) Supine hip abduction x8 bilaterally • Hip, knee, and ankle PROM flexion/extension x5 bilaterally during breaks • (+) tibiofemoral joint distraction of right knee	All exercises to tolerance Except: • Ankle alphabet • Supine hip abduction • PROM Joint mobilization was performed only as necessary to address joint ROM deficits present. (Outcome measures performed this date, limiting further additions to HEP due to fatigue)
5	• Seated heel raises • Seated toe raises • (+) Long arc quads with 0.5# ankle weights • Supine abdominal (TA) marching • Ankle alphabet x1 bilaterally • Supine hip abduction x8 bilaterally • Hip, knee, and ankle PROM flexion/extension x5 bilaterally during breaks • (+) ankle circles (AROM) clockwise and counterclockwise x5 each on BAPS board at level 2 • (+) gait training in parallel bars: 1) Heel → toe rocking on right foot to address foot drop 2) Progress to heel → toe with swing through of left foot 3) Progress to walking in parallel bars with emphasis on heel → toe rockers 4) Progress to hand-held assistance outside of parallel bars x20 feet • Education on core strength in relation to gait and addressing residual back pain	All exercises to tolerance Except: • Ankle alphabet • Supine hip abduction • PROM • Ankle circles on BAPS

Note: (+) indicates addition to HEP or progression of exercise within HEP.

Table 4: Gait Training Progression.

Location	Beginning Stance/Activity	Ending Stance/Activity
Parallel bars	Heel strike	Swing through to forefoot stance
Parallel bars	Heel strike emphasized through full gait cycle	Multiple steps through gait cycle to end of parallel bars
30 feet in gym with hand-held assistance	Full gait cycle (emphasis on heel strike)	Full gait cycle (emphasis on heel strike)

Outcomes

The patient's progression and objective outcome measures during each treatment session are summarized in table 5. Overall, the outcomes demonstrated that the patient made significant gains in strength and endurance. There were a few outcome measures unable to be applied during the first evaluation because the patient's increased level of fatigue after performing certain tests described previously. The scores on the LEFS, Oswestry, TUG, and 30-Second Chair Stand Test suggested that there were still significant deficits and fall risk for this patient even after three therapy sessions and compliance with the prescribed home exercise program. The therapeutic exercises

Table 5: Reassessment Findings and Progressions per Therapy Session.

Visit	AROM/PROM	Strength	Pain	Gait	LEFS	Oswestry	TUG	30 sec chair stand test
1	Decreased ankle dorsiflexion bilaterally; decreased ankle supination on right side	Decreased right LE strength in all planes; decreased left LE strength with hip flexion, knee flexion, and ankle supination	5/10 back pain when supine	R sided foot drop present with antalgic gait with use of walker PRN	13/80	NT	NT due to fatigue	NT due to fatigue
2	No changes in ROM since eval	Demonstrated foot drop, pt reported weakness in LE continued to progress	0/10, but progressive numbness/ tingling	R sided foot drop present with antalgic gait with no walker	NT	NT	NT	NT
3	Began incorporating PROM into rehab, pt demonstrated cogwheel rigidity with PROM with knee extension from flexed position	Increasing/ maintaining strength by adding ankle alphabet in supine	0/10, but reported tightness present	R sided foot drop and antalgic gait	NT	NT	NT	NT
4	Tightness in R knee with AROM that was decreased with TFJ distraction; Cogwheel rigidity present with PROM and AROM in R LE with flexion and extension, but less intense than previous visit	Increased strength as pt was able to perform TUG, 30 second chair stand test, and full HEP	0/10, but reported she was getting feeling back in bottom of her R foot (completed last dose of steroid the next day)	Decreased terminal knee extension which was increased after TFJ distraction to decrease tightness/ stiffness, foot drop present	NT	38%	18.06 seconds	10
5	Decreased cogwheel rigidity with AROM and PROM	Increasing strength with HEP and increased endurance as pt was able to successfully attempt and practice gait training	1/10 in back due to increased activity the day prior & reported she could feel heat/cold at bottom of R foot	Gait training attempted and pt demonstrated ability to walk heel → toe in parallel bars and out of parallel bars, maintained proper mechanics following therapy session	NT	NT	NT	NT

NT: not tested; LFES: Lower Extremity Functional Scale; TUG: Timed Up and Go Test.

performed by the patient during each treatment session were progressed per patient tolerance, and repetitions and sets were not specified due to the fluctuating nature of the patient's fatigue.

Based on patient's subjective report, she felt the PT program was very helpful especially the home exercise program improved her endurance throughout the day. However, she reported that she would be exhausted and fatigued by the end of certain days that consisted of increased activity. Over the course of the patient's time being seen, she was simultaneously taking prescribed corticosteroids (Prednisone) to assist in recovery from diagnosis. The patient demonstrated increased exercise tolerance over the duration of two weeks. In addition, the patient reported she was able to feel hot and cold sensations when she arrived at therapy during the last two visits.

Discussion

This case report presented an evidence-based PT examinations and management on a 25-year-old female patient with TM. Both objective evaluations and subjective feedback indicated that the PT plan of care was helpful to improve patient's clinical symptoms. While clinical research on TM is very limited, literature suggested that the rehabilitation strategy for acute TM need to be activity-based and impairment-emphasized [1]. The PT treatment needs to incorporate functional tasks and movements into exercise programs, including passive and active ROM exercises, strengthening exercises, joint mobilizations as necessary, and neuromuscular re-education [12,13]. In this case report, the PT treatment program was specifically tailored due to the patient's fatigue situation by breaking down each functional activity. Fatigue is one of the most common symptoms on people with TM [15,16]. Therefore, education including energy conservation techniques need to be emphasized during PT treatment. In addition, complex functional activities may not be appropriate for patients with TM, because the patients may become fatigued quickly. When prescribing therapeutic exercise, physical therapists may need to break down one functional movement into several actions, as well as instruct patients how each single exercise would be functionally important and relevant in tasks of daily living.

The limitation of this case report would be that there was no follow-up data for the outcome measures. The patient did not return to therapy for her final appointment, so final data were unable to be collected to compare with the measures recorded earlier. In addition, the patient demonstrated an improvement in strength and endurance. However, these gains might have been in part due to the administration of corticosteroids by the patient's neurologist throughout the course of treatment. Another limitation might have been that there was not a more extensive neurological screen done at the time of initial evaluation. This was due to the patient's fatiguability. However, it should be noted that tests such as position and vibration sensation and deep tendon reflexes might further identify more specific deficits based on the level of involved spinal cord segments.

In summary, this case report demonstrated that PT might be beneficial for people with TM. Experimental research with more TM patients is required in the future to determine whether a measureable benefit of PT exists for this population.

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