TOPICS IN VESTIBULAR PHYSICAL THERAPY

VESTIBULAR REHABILITATION SIG

APTA & Academy of Neurologic Physical Therapy

VESTIBULAR DYSFUNCTION & PERIPHERAL NEUROPATHIES

IN THIS ISSUE PAGE

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Message from the Chair

Rachel Wellons, PT, DPT*
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It was great to see everyone in San Diego at Combined Sections Meeting.

I'd like to recognize the winners of the Vestibular SIG Service and Research Awards. The Service Award goes to **Holly Roberts, PT, Ph.D.*^**. In addition to serving as secretary to the Vestibular SIG, Holly is the co-chair of the Vestibular Hypofunction task force, a member of the Entry-Level Vestibular Rehabilitation Content task force, and guest editor of the Fall/Winter 2021 issue of TVPT. The Research Award goes to **Courtney Hall, PT, Ph.D.** If I listed all of Courtney's research accomplishments, they would take the rest of this publication! The highlights of her accomplishments are lead author on the Vestibular Hypofunction Clinical Practice Guidelines (original and updated versions), multiple peer reviewed papers and presentations, and Principle Investigator (PI) or Co-PI on several grants funding $1,000,000 or more. **Wendy Carender, PT*** won the award for best article in this publication for her article entitled "Acute Unilateral Vestibular Hypofunction – Application of the Updated Clinical Practice Guideline for Peripheral Vestibular Hypofunction: A Case Report". The Vestibular SIG also thanked **Heidi Roth, PT, DHS** for her service over the past 3 years on the Nominating Committee.

There were 7 posters and 2 platform presentations in the area of Vestibular Rehabilitation at CSM. **John Dorangricchia, PT, DPT** won the award for the Best Case Study Poster for his poster entitled "Improved Balance Post Resolution of Benign Paroxysmal Positional Vertigo in an Ataxic Patient: Case Report". **Mark David Stephens, PT, DPT, Ashley Mwongela, and Janene M. Holmberg, PT, DPT** won the award for the Best Research Poster for their poster entitled "Preliminary Data for Individuals with Dizziness in the Emergency Department Prior to Standardized Vestibular Program". **Linda D'Silva, PT, Ph.D., Tarah Phongsavath, Kelly Partington, Frances Korer, Timothy Zehnbauer, Karen Melissa Skop, Nathan Pickle**, and **Paulien Roos** won the award for the Best Special Interest Report for their poster entitled "Piloting an Interactive App for Vestibular Rehabilitation to Improve Performance and Increase Enjoyment". Thank you to **DeJ'a Crippen** for organizing poster judges and to **James Chia-Cheng, Holly Roberts**, and **Lisa Heusel-Gillig** for judging the posters.

In 2022 the Vestibular SIG continued to update and modify popular resources, such as fact sheets, the provider map, and TVPT publications, to reflect the changes in practice. This past year numerous educational opportunities were offered to advance practice in Vestibular Rehabilitation from informal options such as the Monthly Facebook Live events to sponsoring conferences such as the International Conference for Vestibular Rehabilitation. One of the ways to find out about all we have to offer is by following us on social media on Twitter, Facebook, and Instagram. **April Hodge** leads our excellent social media team to keep us all informed of this great work.

The Vestibular SIG has started a new initiative to spark conversation and collaboration between our members. Vestibular SIG Vice Chair **Lisa Heusel-Gillig** has started an online Zoom networking session on the last Wednesday of the month, every other month, as a place for members to come and talk about practice issues, ask questions, problem solve through difficult cases, and to learn from each other. Sessions have been held on 3/29 and 5/31. We look forward to the next sessions on 7/26 and 9/27.

We are an organization only as strong as our leadership team and members, and our 1,796 members make us strong indeed! Thank you again to the members of the Vestibular SIG leadership team and members. We are great because of your passion, dedication, and participation.

Introduction to the Topic

Linda D'Silva, PT, PhD*

The vestibular system makes significant contributions to both sensory and motor systems. As a sensory system, it provides the central nervous system with information regarding the motion of the head as well as its position in space. The central nervous system uses this information with the visual and somatosensory systems to create an internal map of the position and movement of the entire body in relation to the environment. The vestibular system contributes directly to motor output by producing compensatory eye movements to maintain a stable gaze and coordinate postural control during movement. The maintenance of balance depends on information provided by the somatosensory, visual, and vestibular organs. These sensory systems provide information regarding body orientation within different frames of reference. Mirka and Black have stated that "vestibular input is referenced to gravity, while somatosensory and visual inputs are referenced to the support surface and visual surrounds. Hence, the vestibular system provides orientation to earth vertical, while the other senses provide relative orientation references".(1)

Injury or disease of the vestibular system results in dizziness, imbalance, and gait impairments. However, when damage occurs to more than one sensory system, the effects on mobility and balance can be devastating. Peripheral neuropathy and resulting loss/alteration of somatosensory function in the presence of vestibular dysfunction can lead to many functional deficits. This issue of Topics in Vestibular Physical Therapy highlights a few conditions where vestibular and somatosensory, and possibly even visual dysfunction may co-exist.

We begin by discussing a metabolic disorder commonly seen in physical therapy practice, Type 2 Diabetes (T2D). Diabetic peripheral neuropathy (DPN) is common and affects up to two-thirds of individuals with diabetes, and is characterized by pain, paresthesia, and sensory loss.(2) People with DPN have decreased postural stability, (3) which is most evident with eyes closed conditions, demonstrating a reliance on vision to compensate for sensory deficits.(4) Because of decreased proprioceptive feedback, people with T2D walk slower and have greater stride variability thus increasing their risk of falls.(5) Unfortunately, T2D also affects the vestibular system, with the odds of developing vestibular dysfunction being 70% higher, especially with a longer duration and poorer control of blood glucose levels.(6) Our studies show that people with T2D and associated hypertension had a higher prevalence of benign paroxysmal positional vertigo (BPPV).(7) Postural sway was significantly higher in people with T2D and concurrent BPPV.(8)

As we consider the effects of T2D on various sensory systems, we need to realize that people with T2D and DN may be unable to reweight their sensory systems to meet the demands of daily life. Participating in outdoor walking programs may be difficult for people with vestibular and somatosensory deficits especially if they must walk on uneven sidewalks. Identifying and treating BPPV or vestibular hypofunction in this population is essential, however, despite successful treatment of dizziness/vertigo, balance deficits may persist. Combining gait, balance, and functional training is crucial to improve activity levels and quality of life in people with DPN, (9) however, the role of vestibular rehabilitation to improve functional deficits in people with DPN requires further study.

In this edition, we highlight other conditions where the vestibular system may be affected alongside sensory system pathology. A case series will highlight the management of a person with Chemotherapy Induced Peripheral Neuropathy (CIPN) and Idiopathic Peripheral Neuropathy (IPN) with co-existing vestibular impairment. A case report will feature the use of vestibular rehabilitation in a patient with CIPN, and a person with Guillain-Barre syndrome.

As we review these cases, the Clinical Practice

Guidelines for Vestibular Hypofunction provide valuable details for clinical care. Patients who have both a vestibular hypofunction co-existing with peripheral neuropathy may require additional treatment sessions to achieve their full potential for recovery. Educating patients about the plan of care and expected recovery are important. Also, the treatment protocol must be grounded in evidence and based on existing deficits, therefore, a thorough evaluation of both the vestibular and somatosensory systems is essential.

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Are you interested in writing a literature review?

The VR SIG Newsletter can provide mentorship to help you contribute.
Contact: Anne Galgon at galgonanne56@gmail.com

Vestibular Physical Therapy Management of Patients with Idiopathic Peripheral Neuropathy and Chemotherapy Induced Peripheral Neuropathy: A Case Series

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ABSTRACT
Introduction: Physical therapists often receive referrals to manage balance related problems in individuals with peripheral neuropathies. Vestibular related impairment in those cases may not be recognized. This case series aims to describe the identification of vestibular impairment and interventions to address it in patients with idiopathic peripheral neuropathy (IPN) and chemotherapy induced peripheral neuropathy (CIPN). **Case Descriptions:** An 80-year-old female diagnosed with IPN and a 70-year-old male diagnosed with CIPN were evaluated in physical therapy due to imbalance and gait deficits. Neither of the patients complained of dizziness. In addition to balance and gait deficits, both patients demonstrated abnormality in gaze stabilization identified via Dynamic Visual Acuity (DVA) tests. **Intervention:** In addition to variable balance, walking, and aerobic exercise, both patients received gaze stabilization exercises (VOR X1) after gaze stabilization impairments were identified. **Outcomes:** The patient with IPN demonstrated improvements in Functional Gait Assessment (FGA), gait speed, Five Times Sit to Stand, and normalization of vestibulo-ocular reflex (VOR) function assessed with DVA tests after participating in 8 physical therapy sessions. After 16 sessions, the patient demonstrated further improvement on FGA and the Activities of Balance Confidence (ABC) Scale. Lastly, the patient with CIPN showed improved outcomes on FGA, gait speed, ABC Scale, and normalization of VOR function after 13 physical therapy sessions. **Discussion:** Both case studies successfully improved all outcomes when vestibular impairments were identified and addressed. Additionally, both patients demonstrated improvements in balance and walking function.

Introduction

Peripheral neuropathy (PN) is a disorder of nerve cells and fibers that can be classified using different methods depending on the underlying cause as typically metabolic, systemic, toxic, or idiopathic. It is a pathological condition of the peripheral nerves that can affect motor, sensory, and autonomic fibers. Paresthesias, muscle weakness, impaired reflexes, and autonomic symptoms typically characterize PN. (1-3) In addition to more commonly known PNs, such as diabetic PN, idiopathic PN (IPN), and chemotherapy induced peripheral neuropathy (CIPN), a review of the literature indicates that vestibular involvement is a common finding in many PNs of different etiologies that are not as prevalent.(4) Specifically, studies have shown vestibular impairment is a result of conditions such as anti-GQ1b antibody syndrome, cerebellar ataxia with neuropathy and vestibular areflexia syndrome (CANVAS), and Charcot Marie Tooth (CMT) disease.

In a study performed by Lee et al. (5), the aim was to delineate the clinical features and ocular motor findings in acute vestibular syndrome associated with patients with anti-GQ1b antibodies. Anti-GQ1b antibodies can be associated with diagnoses such as typical Miller-Fisher Syndrome, acute ophthalmoplegia without ataxia, Guillain-Barre syndrome with ophthalmoplegia, and Bickerstaff brainstem encephalitis. The 11 patients with anti-GQ1b antibody syndrome demonstrated positive ocular motor findings suggestive of vestibular involvement, including head-shaking nystagmus, spontaneous nystagmus, gaze-evoked nystagmus, central positional nystagmus, canal paresis, and abnormal head impulse test (HIT). Furthermore, anti-GQ1b antibodies may cause acute vestibulopathy involving central or peripheral vestibular structures.(5)

CANVAS is an inherited syndrome with a triad of symptoms, including cerebellar impairment, bilateral vestibulopathy, and somatosensory deficits. The characteristic clinical sign is an abnormal visually enhanced VOR. In an investigation performed by Szmulewicz et al., of 14 patients with CANVAS (6,7), it was suggested that a neurophysiological assessment was conducted to diagnose sensory neuropathy in patients with cerebellar and vestibular impairment. This assessment was recommended for those whose degree of ataxia was out of proportion with the clinically apparent cause(s) of ataxia.

CMT is a hereditary neuropathy characterized by prominent unsteadiness due to motor and sensory loss, affecting 9-28 out of 100,000 people. A study by Pérez-Garrigues et al. (8) aimed to determine whether the imbalance in patients with CMT type 4c disorder is caused by reduced proprioceptive input or if vestibular nerve involvement is an additional factor. In comparing ten patients with CMT type 4C disorder and ten age and sex-matched controls, vestibular evaluation demonstrated significant vestibular impairment findings in patients with CMT compared to controls; however, none of the patients experienced dizziness.

Clinically, CIPN is primarily a sensory neuropathy that may be accompanied by motor and autonomic changes of varying intensity and duration in addition to ototoxicity, with hearing deficits being the most reported.(10) CIPN is a frequent complication of chemotherapy, with a prevalence ranging from 19% to 85% and over.(9,10) This is especially seen now as patients undergo more effective cancer treatments and live longer. In a scoping review by Prayuenyong et al. (11), several studies reported significant evidence of vestibular toxicity associated with platinum-based chemotherapy, especially Cisplatin. Objective tests confirmed these findings, although they did not always corroborate with patient symptoms.

In addition to these specific causes of PN, IPN affects an estimated 5–8 million Americans, comprising about one-third of all patients with PN. It is considered a significant public health problem in the United States. IPN typically occurs in people 60 years or older, and there is no obvious etiology to cause damage to the peripheral nervous system. Additionally, symptoms can appear over months to years.(12)

Patients with PN of known and unknown origins are frequently referred to physical therapy due to complaints of imbalance, difficulty walking, and increased fall risk. The association with the benefit of physical therapy intervention has long been shown to improve patient outcomes. Despite this, there is a lack of evidence citing the importance of utilizing vestibular screening tools to identify vestibular impairment in those with PN. Thus, when evaluations include appropriate vestibular screening tools, physical therapists can be critically important in determining vestibular involvement associated with PN.

The purpose of this case series is to describe the identification of vestibular impairment and the resulting physical therapy intervention of an individual with IPN and an individual with CIPN.

CASE DESCRIPTIONS

Case Study 1: Vestibular physical therapy management of a person with idiopathic peripheral neuropathy

History

An 80-year-old female was referred to physical therapy for balance and gait training due to peripheral neuropathy. The patient was diagnosed with IPN five years before the initial physical therapy evaluation. Electromyography was positive for sensorimotor polyneuropathy with mixed axonal and demyelinating features with no apparent causes of peripheral nerve damage. She reported numbness in bilateral feet and gradual worsening of balance and walking. The patient experienced one fall within the last year. She had no history of a vestibular diagnosis and did not report dizziness. She never received vestibular therapy. The patient's self-stated goals were to improve balance and safety with walking.

Examination

The patient had normal 5/5 strength in bilateral lower extremities. Sensation testing in bilateral lower extremities revealed intact light touch, decreased vibratory sense, and proprioception distally. Deep tendon reflexes were absent in bilateral ankles. The Romberg sign was positive. The patient ambulated without an assistive device, with a wide-based ataxic gait.

Outcome Measures

Subjective reported and performance-based outcome measures were used during the initial examination and included: Activities of Balance Confidence (ABC) 37.31%, preferred gait speed 0.69 m/s, fast gait speed 1.06 m/sec, Five Times Sit to Stand (FTSTS) 19.40 sec, and FGA 11/30.

Vestibular System Function Tests

Function of the vestibular system was examined with the manual and computerized Dynamic Visual Acuity Test (DVA) to assess the patient's gaze stability during head movements. The manual DVA showed a 0.4 LogMAR difference (4 lines "lost" on an eye chart between static visual acuity and visual acuity with the examiner passively rotating the patient's head). The computerized DVA showed 0.51 LogMAR (0.33 LogMAR difference or less is normal). The gaze stabilization test showed decreased head movement velocity to 102 deg/sec (normal angular velocity is 120 deg/sec or more).

Assessment/Diagnosis

The subjective reported outcome measure results reflected decreased balance confidence. Performance-based outcome measures indicated an impaired ability to perform transitional movements, decreased balance during ambulation, limited community ambulation, and increased fall risk. It was hypothesized that IPN affected the vestibular nerve gradually and subtly over time since cranial nerves are generally considered peripheral nervous system components. The published literature suggests vestibular involvement in various peripheral neuropathies. With the above hypothesis, the DVA test was chosen to assess the vestibulo-ocular reflex (VOR) function and gaze stability. Both manual and computerized DVA tests showed decreased function of the VOR. This patient's initial physical therapy diagnosis was imbalance due to IPN and vestibular disequilibrium/vestibular dysfunction due to impaired gaze stabilization.

Intervention

The patient was seen twice weekly for 16 sessions. Aerobic exercise consisted of treadmill walking, stationary bike, and overground ambulation. Static and dynamic standing balance included activities on a hard surface, foam, rocker board, incline, narrow base of support, and single leg support. Dynamic walking balance incorporated ambulation with head turning, ambulation forward/backwards, ambulation with direction changing, and ambulation with eyes open and eyes closed. In addition to the above exercises, gaze stabilization exercises (VOR x1 viewing) were added to address the patient's deficit in VOR function. The patient was provided with a home exercise program, which included gaze stabilization exercises.

Outcomes

After eight physical therapy visits, FGA improved to 17/30, preferred gait speed to 1.15 m/sec, fast gait speed to 1.26 m/sec, and FTSTS to 14.80 sec.

Table 1. Comparison of pre and post-intervention outcome measures and results of Dynamic Visual acuity (DVA)

	Initial Evaluation-Visit #1	Re-evaluation-Visit # 8	Discharge-Visit # 16
FGA	11/30	17/30	21/30
10MWT	Preferred gait speed: 0.95 m/sec Fast gait speed: 1.06 m/sec	Preferred gait speed: 1.15 m/sec Fast gait speed: 1.26 m/sec	NT
FTSTS	19.40 sec	14.80 sec	NT
ABC Scale	37.31%	NT	74.37%
Manual DVA	0.4 LogMAR difference - 4 lines difference	0.2 LogMAR difference - 2 lines difference	NT
Computerized DVA	Left: 0.51 LogMAR Right: 0.13 Log MAR Left Velocity: 159 deg/sec Right Velocity: 110 deg/sec	Left: 0.24 LogMAR Right: 0.30 LogMAR Left Velocity: 148 deg/sec Right Velocity: 141 deg/sec	NT
Computerized Gaze Stabilization Test	Left: 102 deg/sec Right: not detectable	Left: 142 deg/sec Right: 137 deg/sec	NT

Note: FGA = Functional Gait Assessment, 10MWT = Ten-meter walk test, FTSTS = Five times sit to stand, ABC = Activities of Balance Confidence.

Manual DVA improved from 4 lines difference (0.4 LogMar) to 2 lines difference (0.2 LogMar). Computerized DVA improved to 0.24 LogMar difference, and the patient demonstrated normal velocity of head turning (>120 deg/sec) during the computerized gaze stabilization test. These findings indicated improved and normalized function of VOR. After 16 sessions, she demonstrated an additional improvement in dynamic balance during ambulation as per the FGA score of 21/30 and a significant improvement in balance confidence with an ABC score of 74.37%. See Table 1 for pre and post-intervention outcome measures and results.

Case Study 2: Vestibular Physical therapy management of a person with chemotherapy induced peripheral neuropathy

History

A 70-year-old male with multiple myeloma presented to outpatient physical therapy for balance and gait training. He was diagnosed with multiple myeloma seven months before his physical therapy evaluation. He complained of numbness in his hands and feet, imbalance, and bilateral foot drop. He used a cane for community ambulation and did not use an ankle foot orthosis (AFO) or bracing at the time of the initial evaluation. The patient did not have a history of a vestibular diagnosis and did not report symptoms of dizziness. He never received vestibular therapy before the initial evaluation. His goal was to improve balance and gait with an appropriate assistive device.

Examination

The patient had 5/5 muscle strength in bilateral hips and knees. His muscle strength in his right ankle was as follows: dorsiflexion 1/5, inversion 4/5, eversion 2/5, plantar flexion 5/5; muscle strength in right toe extension was 0/5. The muscle strength in his left ankle was as follows: dorsiflexion 2/5, inversion 4/5, eversion 2+/5, plantarflexion 5/5, and left great toe extension was 0/5. Sensation testing in bilateral lower extremities revealed intact light touch, vibratory sense, and proprioception bilaterally. Deep tendon reflexes were absent in bilateral ankles, and pinprick sensation was diminished in bilateral lower extremities. The patient ambulated with a cane and steppage gait pattern.

Outcome Measures

Performance-based outcome measures were used during the initial examination and included: preferred gait speed of 0.69 m/s without an assistive device, FGA 11/30, 6 Minute Walk Test (6MWT) 320 meters without an assistive device. The results of the outcome measures indicated increased fall risk, limited community ambulation, and decreased endurance.

Vestibular System Function Tests

Function of the vestibular system was examined with the manual and computerized DVA to assess the patient's gaze stability during head movements. The manual DVA showed a 0.3 LogMAR difference, and the computerized DVA showed a 0.13 LogMar difference, with decreased velocity bilaterally throughout. The computerized gaze stabilization test showed 132 degrees per second of head movement.

Assessment/Diagnosis

The results of the performance-based outcome measures demonstrated impaired balance during dynamic gait activities, decreased endurance, limited community ambulation, and increased fall risk. As previously stated, there is evidence that shows the correlation between the use of specific chemotherapy agents and the presence of vestibular toxicity. DVA testing was chosen to assess the vestibular ocular reflex (VOR) function and gaze stability. Manual and computerized DVA tests showed decreased VOR functioning and impaired gaze stability. This patient's initial physical therapy diagnosis was imbalance due to CIPN and vestibular disequilibrium/vestibular dysfunction due to impaired gaze stabilization.

Intervention

The patient was seen twice weekly for 13 sessions. He performed static balance, dynamic balance, gait training, closed-chain lower extremity strengthening, and aerobic exercises throughout his course of care. He participated in eyes open and closed tasks on firm and compliant surfaces for static balance tasks. Dynamic gait tasks included walking with head turns, direction change, and with eyes opened and closed. His aerobic exercise routine consisted of working on the treadmill and stationary bike. Overground gait training consisted of ambulation with AFOs and using an appropriate assistive device. In addition to the above exercises, he performed gaze stabilization exercises (i.e., VOR x 1 viewing) to address VOR abnormalities. He was prescribed a thorough home exercise program based on the above exercises.

Outcomes

After 13 physical therapy visits, the patient's FGA improved to 23/30, and his preferred gait speed improved to 1.05 m/s without an assistive device. His manual DVA improved to 0.2 LogMAR difference, velocity improvements during computerized DVA to 145 degrees per second, and during the computerized gaze stabilization test to 176 degrees per second.

Discussion

Physical therapists frequently see patients with PNs. The history and physical examination provide essential information to assist in the differential diagnosis of PN and vestibular involvement. With the literature review indicating that vestibular involvement is a common finding in PN of different origins, it is reasonable to recommend vestibular screening for patients diagnosed with PN to identify an abnormality in the vestibular system. Specifically, screening should be centered around abnormality in the VOR function, with the implementation of VOR training if needed. This screening allows for utilizing all systems for maximal achievement, thus decreasing the patient's fall risk.

The above cases demonstrate a possible correlation between IPN and CIPN and vestibular dysfunction based on VOR abnormality identified with the DVA testing. Significant improvement occurred on all fall risk outcome measures, and the VOR function returned to normal after only 8 to 13 sessions of physical therapy with adding gaze stabilization to the balance and walking interventions.

Limitations of both cases include difficulties with generalizing the findings due to only two patients being analyzed. Further investigation is warranted to screen patients with PN of different etiologies for vestibular impairment. In the future, it may be reasonable to promote incorporating vestibular screening into the initial assessment of patients with PN referred to physical therapy for balance dysfunction and fall prevention.

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Table 2. Comparison of pre and post-intervention outcome measures and results of DVA of patient with CIPN

	Initial Evaluation - Visit #1	Re-Evaluation - Visit #9	Discharge- Visit #13
FGA	11/30 without AFOs	19/30 without AFOs	19/30 without AFOs 23/30 with bilateral AFOs
10MWT	Preferred gait speed: 0.69 m/s without AD, without AFOs	Preferred gait speed: 0.98 m/s without AD, without AFOs 1.07 m/s without AD, with bilateral AFOs	Preferred gait speed: 1.05 m/s without AD, without AFOs; 1.10 m/s without AD, with bilateral AFOs
6MWT	320 meters without AD and AFOs	356 meters with straight cane and bilateral AFOs	NT
ABC Scale	NT	83.13%	92.82%
Manual Dynamic Visual Acuity	0.3 LogMAR difference - 3 lines difference	NT	0.2 LogMAR difference - 2 lines difference
Computerized Dynamic Visual Acuity	Left: 0.13 Right: 0.12 Left Velocity: 101 deg/sec Right Velocity: 99 deg/sec	NT	Left: -0.01 Right: 0.18 Left Velocity; 145 deg/sec Right Velocity: 132 deg/sec
Computerized Gaze Stabilization Test	Left: 132 deg/sec Right: 134 deg/sec	NT	Left: 176 deg/sec Right: 177 deg/sec

Note: FGA = Functional Gait Assessment, 10MWT = Ten-meter walk test, 6MWT = Six-minute walk test stand, ABC = Activities of Balance Confidence

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Recognition from CSM VRSIG Meeting

Topics in Vestibular Physical Therapy Best Article of the Year Award

Wendy Carender PT*

Acute Unilateral Vestibular Hypofunction - Application of the Updated Clinical Practice Guideline for Peripheral Vestibular Hypofunction: A Case Report.

Read Wendy's Article in the 2022 Spring Summer Edition https://www.neuropt.org/special-interest-groups/vestibular-rehabilitation/newsletters

Application of Vestibular Rehabilitation in a Patient with Chemotherapy Induced Peripheral Neuropathy

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Kinetic Edge Physical Therapy

ABSTRACT

Introduction: Chemotherapy induced peripheral neuropathy (CIPN) affects 30% of individuals six months after cessation of the delivered agent. These individuals are at an increased risk of falls and have a significant healthcare burden. The Vestibular Hypofunction Clinical Practice Guidelines were used as a framework for evaluating and treating this patient. **Case Description:** The patient is a 71-year-old male presenting to physical therapy for new-onset CIPN. The patient has a history of colon cancer stage III, T3, N2a, which was diagnosed 15 months prior to the initial evaluation. Additionally, the patient has a past medical history that includes coronary artery disease, bilateral hip replacement, and a right knee replacement. **Intervention:** The patient was given a home exercise program for balance and strengthening. Also, while attending physical therapy sessions, he completed vestibular rehabilitation following the vestibular hypofunction guidelines. **Outcomes:** At four weeks, the patient was discharged with improved balance, gait speed, vestibular function, and the ability to complete dual tasks in a shorter time. **Discussion:** CIPN is a common condition following chemotherapy for multiple types of cancer. Although this is a common complication, it is often not addressed until the patient complains of balance deficits with or without falls. Patients undergoing chemotherapy with agents that commonly cause CIPN should be referred to skilled vestibular rehabilitation to improve sensory integration and decrease their risk of falls. It is also necessary to educate patients and healthcare providers before deficits become apparent or a fall occurs.

Introduction

Chemotherapy-induced peripheral neuropathy (CIPN) is a common side effect of chemotherapy agents used to treat cancer. Peripheral neuropathy is nerve damage with subsequent sensory symptoms that present with or without motor symptoms, including pain, numbness, tingling, or muscle weakness. Although the prevalence of CIPN reduces after the cessation of chemotherapy, it is estimated that 30% of patients continue to have CIPN at six months.(1)

Individuals with CIPN are nearly three times more likely to have a fall event than those without.(2) Furthermore, falls can result in injury, possible death, and an average healthcare cost of $14,000 for each fall.(3)

No agent is currently shown to prevent or reverse the damage of CIPN.(4,5) The bulk of the research demonstrates a loss of peripheral sensation; however, neurotoxic effects have been noted to include vestibular loss. Due to this, it would be beneficial for these individuals to be referred to physical therapy to reduce their risk of falls.

Current research supports physical therapy for individuals with peripheral neuropathy with treatments including posture, gait, and endurance training.(6-10) Research also indicates that Tai Chi can help reduce fall risk.(11) Although current research indicates that physical therapy may be beneficial in reducing fall risk in individuals with CIPN (12), but there is little information on specific intervention strategies. Current research also indicates that physical therapy in this population may be limited by cost, time commitment, and patient motivation.(13)

Individuals with CIPN demonstrate reduced postural stability secondary to a loss of peripheral sensation and possible loss of vestibular function. The peripheral vestibular hypofunction clinical practice guidelines (14), meant to improve gaze and postural stability in individuals with vestibular hypofunction, would be a valuable guide to treatment.

The purpose of this case report is to utilize the peripheral vestibular hypofunction clinical practice guidelines with an individual who has CIPN as a guide to treat fall risk.

CASE DESCRIPTION

History

The patient is a 71-year-old male presenting to outpatient physical therapy for new onset CIPN. He was referred to physical therapy by his oncologist six months after the cessation of chemotherapy. The patient has a history of colon cancer stage III, T3, N2a,diagnosed 15 months prior to the initial evaluation. He has undergone neoadjuvant and adjuvant chemotherapy and a laparoscopic transverse colectomy. The patient's past medical history includes coronary artery disease, bilateral hip replacement, and a right knee replacement. The patient complained of imbalance with his eyes closed and difficulties with quick rotation. Additionally, the patient reported no history of falls. He is attending physical therapy at the persistence of his physician.

Examination

The physical therapy evaluation included a subjective history of the current condition, assessment of cervical active range of motion, lower extremity strength testing, gait, balance, sensation, and completion of the Activities-Specific Balance Confidence scale outcome measure (Table 1).

These tests were completed to identify impairments and determine whether physical therapy was warranted. The recommended outcome measures in the peripheral vestibular hypofunction guidelines include The Activities-Specific Balance Confidence (ABC) Scale and the Dynamic Gait Index (DGI).

The ABC is a subjective outcome measure that patients rate the percentage, 0-100%, of confidence they have in completing each task on the scale. This scale is intended for individuals with neurological conditions that affect balance. It cannot discriminate between fallers and non-fallers in adult cancer populations; no reliability has been established.(15) The patient rated himself as 100% on the ABC indicating he did not perceive any disability related to his balance.

The DGI is an outcome measure assessing gait and balance, subsequently determining fall risk. Along with the Modified Clinical Test of Sensory Interaction on Balance, the DGI was utilized due to the patient's significant peripheral neuropathy. The DGI has eight different walking tasks that the patient must complete. Evidence supports using this outcome measure for individuals with neurological disorders, community dwelling older adults, and healthy adults.(16) In individuals with vestibular dysfunction, the test-retest reliability (ICC=0.86) and the internal consistency (a=0.85) are excellent. It has excellent concurrent validity (0.71) compared to the Berg Balance Scale. The patient demonstrated an initial score of 19/24, and the following test items presented as a challenge: gait speed, change in gait speed, gait with horizontal head turns, gait and pivot turn, and steps.

The Modified Clinical Test of Sensory Interaction on Balance (mCTSIB) is an outcome measure used to quantify postural control in different conditions and is used in neurological populations. There is minimal data on the reliability and validity of this outcome measure.(17) For the current patient, there was an increased postural sway in all conditions except Romberg, with eyes open on a firm surface.

A standing vestibular ocular reflex (VOR x 1) was also completed at the patient self regulated head speed. The patient reported no dizziness, but significant imbalance was noted.

Diagnosis/Prognosis

Based on the gait speed, DGI score, and balance assessment, the patient was determined to be at risk for falls and appropriate for physical therapy intervention. In addition to severe peripheral neuropathy, vestibular involvement was suspected due to imbalances with turning, head movements, and reliance on the vestibular system for balance during the mCTSIB. Therefore, the vestibular hypofunction guidelines were utilized to develop the intervention program.

Although the patient had high confidence, as demonstrated by the ABC, and no perception of disability, with education, the patient agreed to treatment and was set at a frequency of 1 time per week for 4 weeks. The goal of treatment was to reduce the patient's fall risk utilizing current practice guidelines. If the treatment approach were effective, the physical therapist would be able to progress the difficulty of his treatment plan and home exercise program each week.

Intervention

Treatment was developed to reduce the patient's overall fall risk utilizing the peripheral vestibular hypofunction clinical practice guidelines for static and dynamic balance and gait interventions. Gaze stabilization was included due to significant imbalances demonstrated with head movements while ambulating and with VOR x 1 in standing.

Due to the patient presenting with minimal symptoms, acute gaze stabilization dosing from the peripheral vestibular hypofunction guideline was utilized for the patient’s home exercise program. The acute gaze stabilization exercises were to be performed three times per day for a total of 12 minutes.

A licensed physical therapist conducted one-on-one reatment sessions in an outpatient setting for approximately 30 minutes, one time per week, for four weeks following the initial evaluation. A typical session consisted of targeted interventions that were re-evaluated and progressed based on improvements demonstrated by the patient (Table 2). The patient's home exercise program for gaze stabilization progressed each session based on performance in the clinic.

Outcomes

The patient was seen at the initial evaluation and for four weekly follow-up treatment sessions. At five weeks, the patient was discharged from outpatient physical therapy with a low risk for falls, improved balance on all conditions of mCTSIB, gait speed to within normal range for age and gender, improved gaze stabilization with reduced imbalance, improved DGI to 24/24, and improved ability to dual task without a physical or cognitive dual task cost (Table 1). It is important to note that the patient had a significant improvement in reducing his fall risk, but there were no significant changes in sensory symptoms.

Discussion

Chemotherapy-induced peripheral neuropathy is a common condition following chemotherapy for multiple types of cancer. Although this is a common complication, it is often not addressed until the patient complains of balance deficits or falls. Patients who undergo chemotherapy with agents that commonly cause CIPN should be referred to physical therapy to be evaluated and treated to decrease their risk of falls and provide education before deficits become evident to the patient and healthcare providers or a fall occurs. Findings demonstrate that patients may benefit from specific balance and gaze stabilization exercises outlined in the peripheral vestibular hypofunction clinical practice guidelines.

The patient was referred to physical therapy for CIPN, presented with no fall history, and had high confidence in balance as indicated on the ABC scale. However, upon further testing, the patient had a profound loss of sensation and was at risk for falls.

A short bout of physical therapy decreased his fall risk despite no change noted in sensory complaints. This patient had movement related and head movement imbalance complicated by hip and knee deficits secondary to hip and knee replacements, and neuropathy. His treatment was very successful, targeting vestibular integration. Utilization of the peripheral vestibular hypofunction clinical practice guidelines helped progress the patient based on his primary impairments.

A limitation of this case study is there is no direct measure of vestibular function, only indirect measures, including head movements and gaze stabilization. The lack of vestibular testing limits our ability to determine if the patient had underlying vestibular damage or a sensory weighting issue due to neuropathy. However, targeting head movement related and sensory integration balance activities improved his balance over a relatively short period. Additionally, the outcomes of this case study may not generalize to others with CIPN. More research is needed to understand the extent of vestibular involvement in individuals with CIPN and the effectiveness of vestibular rehabilitation.

Summary

Utilizing the peripheral vestibular hypofunction guidelines for an individual with chemotherapy-induced peripheral neuropathy in an outpatient setting is beneficial for identifying fall risk and providing guided treatment to reduce fall risk quickly and efficiently.

Table 1: Initial and discharge testing results

Test	Initial	Discharge
LE strength	Unremarkable	Unremarkable
Gait speed	3.84ft/sec	5.02ft/sec
Gait with head turns	Imbalance with horizontal	Normal
Gait pattern	Asymmetrical antalgic due to orthopedic conditions	Asymmetrical antalgic due to orthopedic conditions
Sensation	Complete loss of protective sensation and abnormal vibratory sensation	Complete loss of protective sensation and abnormal vibratory sensation
mCTSIB	Condition 1: 30 sec, no sway Condition 2: 30 sec, mild increased postural sway Condition 3: 30 sec, mild increased postural sway Condition 4: 30 sec, moderate increased postural sway	Condition 1: 30 sec, no sway Condition 2: 30 sec, no sway Condition 3: 30 sec, no sway Condition 4: 30 sec, moderate increased postural sway
Gaze stabilization	Increased sway with vertical > horizontal	Normal
TUG	L turn: 7.35 sec R turn: 7.098 sec COG: 7.42 sec, 1 error	L turn: 7 sec R turn: 6.82 sec COG: 6.52 sec, 1 error
DGI	19/24	24/24
ABC	100%	100%

Table 2: General treatment plan

Session	2	3	4	5
Gaze stabilization	VOR x 1, standing, firm, set up guidelines for HEP	VOR x 1 - complex background	VOR x 1 - change in surface - foam	VOR x 1 - rocker board
Static balance	Romberg - firm/foam, head movements, eyes open, eyes closed	Romberg, SLS	Romberg, SLS, incline	Romberg, tandem, SLS, incline, rocker board
Dynamic balance	Treadmill with head turns - vert/hor Cone taps Rocker board Stepping	Treadmill with head turns - vert/hor Cone taps Rocker board Stepping - eyes closed Dual tasks Visual tasks	Treadmill with head turns - vert/hor/diagonals Stepping - gravel Dual tasks Floor mat - gravel/marbles	Treadmill with head turns - vert/hor/diagonals Stepping - gravel Dual tasks Obstacle course
LE strengthening				Standing hip strengthening

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Recognition from CSM VRSIG Meeting

Vestibular SIG Service Award
Holly J Roberts, PT, PhD*^

- Secretary of the Vestibular SIG
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- Entry-Level Vestibular Rehabilitation Content Taskforce
- Co-Author of Topics in Vestibular Rehabilitation Article Fall/Winter 2021

The Efficacy of Vestibular Rehabilitation to Improve Balance Outcomes in a Person with Guillain-Barre Syndrome: A Case Report

Benton Lindaman, PT, DPT*
Good Shepherd Penn Partners

ABSTRACT

Introduction: Guillain-Barre syndrome (GBS) is a rare autoimmune disease that damages the peripheral nervous system. Functional recovery occurs over the first year; however, residual deficits can remain in the chronic phases. This case aims to highlight the use of vestibular rehabilitation in a patient with GBS in the chronic phase of recovery. **Case Description:** An 81-year patient with chronic GBS presented to therapy for balance training. His examination demonstrated muscular and somatosensory deficits consistent with the diagnosis and he denied complaints of dizziness or vertigo. His goal was to improve balance and confidence. **Intervention:** The initial plan of care primarily involved various lower extremity strengthening interventions. After ten visits, functional strength significantly improved, but there was a lack of progress within balance outcome measures. Based on a prior Sensory Organization Test (SOT report that indicated reduced vestibular function, the decision was made to switch to a vestibular-based plan of care. **Outcome Measures:** 5 Time Sit to Stand (5TSTS), Functional Gait Assessment (FGA), Activity Balance Confidence Scale (ABC scale), and 10 Meter Walk Test (10MWT) were initially assessed. 5TSTS was the only outcome measure to make statistically significant improvement at re-evaluation. Following implementing a vestibular plan of care, FGA and gait speed improved beyond statistical significance. The SOT was assessed at discharge and compared to a previous plan of care. A significant improvement was noted, mainly through an improved vestibular upregulation within the sensory analysis. **Discussion:** Given the lack of objective progress on balance and walking measures after ten sessions, balance was addressed via the vestibular system within the plan of care. Following vestibular-based interventions, improvements were seen at discharge that were not seen on the progress note. the vestibular system within the plan of care. **Conclusion:** Vestibular rehabilitation may need to be considered as another option for treatment with persons with GBS who have balance deficits, especially in the chronic stage when recovery of somatosensory has likely plateaued.

Introduction

Guillain-Barre syndrome (GBS) is a rare autoimmune disease that damages the peripheral nervous system. Motor impairments can range from muscle weakness to paralysis. GBS impacts approximately 1 in 100,000 individuals annually and is traditionally thought to be preceded by infection.(6) Classic signs and symptoms are distal muscle weakness, impaired respiratory function, areflexia, fatigue, and somatosensory deficits.(6) Functional recovery typically occurs within the first 12 months after onset, with around 80% of patients regaining the ability to walk (2); residual neuropathy can still be present within the chronic phase.(1,3) Using vestibular training with or without visual training could benefit the patient's overall balance if somatosensory recovery is not possible. This case aims to highlight the use of vestibular rehabilitation in a patient with Guillain-Barre Syndrome in the chronic phase of recovery.

CASE DESCRIPTION

History

The patient is an 81-year-old male diagnosed with GBS in the early 1980s with initial arm weakness and decreased grip strength. The patient reported five years to reach his functional plateau. His past medical history is significant for right eye prosthesis, hypertension, and asthma. Recreational activities include maintaining an active lifestyle by teaching martial arts. The patient's primary goal was to "improve balance and confidence.

Examination

Examination demonstrated distal sensory and muscle strength deficits in all four limbs, grossly 4/5 within proximal musculature and roughly 1 or 2/5 in distal musculature as defined by the Medical Research Council (MRC) Scale for Muscle Strength. (14) Table 1 presents his initial outcome measures for the Activities of Balance Confidence Scale (ABC), Five times Sit to Stand (5TST), Functional Gait Assessment (FGA), gait speed, and SOT composite scores.

Initial Assessment

The patient was determined to be at high risk of falls based on the below cut-off values for the 5TSTS and FGA. Given his significant strength deficits, physical therapy services were recommended to optimize his functional ambulation and balance.

Initial Intervention

The initial plan of care was set at a frequency of two times per week for the first five weeks. Sessions focus on addressing his reduction in strength through various lower extremity strengthening interventions. Strength exercises were targeted mainly at extensor-based lower extremity muscles. Interventions included supine and standing conditions and addressed double-limb and single-limb movement patterns.

Re-evaluation

After ten visits, there were significant improvements in functional strength, as noted by an improvement in his 5TSTS. However, there was a lack of progress within the balance outcome measures. Table 1 shows that the ABC, FGA, and gait speed did not change. The decision was made to switch to a vestibular-based plan of care to achieve the patient's primary goal. The SOT from a prior episode of care suggested that somatosensory integration was functional and that the vestibular system was not being utilized effectively for upright posture (See Figure 1a). The rationale considered if the patient was utilizing the three primary sensory systems of balance: vestibular, visual, and somatosensory. Given his long-standing deficits in vision and somatosensation, further improvement in these systems was not anticipated. Addressing the vestibular system could potentially have an effect on his sensory integration of balance which had not been targeted in previous physical therapy episodes.

Revision of Plan of Care

The vestibular program included gaze stabilization exercises and head movements, including X1 and X2 viewing in static standing and dynamic movements, e.g. multidirectional standing, and standing activities on foam. A supplemental home exercise program was also provided for additional repetition and practice. Session frequency was reduced to 1 time a week.

Outcomes

The patient was seen for nine additional visits, totaling 19 physical therapy sessions over approximately 14 weeks. Table 1 also shows outcome measures at discharge. 5TSTS, FGA, ABC scale, and 10MWT were reassessed, with some measures improving beyond the minimal detectable change (MDC) or minimal clinical important difference (MCID). 5TSTS change was greater than MDC at re-evaluation. Overall, ABC scale improved by 10%, and his Global Rating of Change (GROC) score was "Gotten a great deal better." No change was noted at the re-evaluation in the FGA and gait speed; however, both measures improved beyond the MCID at discharge. The patient was measured on the SOT at discharge and compared to performance from a previous episode of care since it was not measured at the initial evaluation. The previous SOT was taken approximately two years earlier, and there was no significant change in medical status or functional activities during this time. Most notable was the improvement in the vestibular preference within the sensory analysis (See Figure 1b). The overall composite score almost doubled, which is well beyond the accepted MCD. All measures at discharge suggest he reduced his fall risk status and his performance within normal values for his age.

Discussion

This case study highlights the benefit of vestibular rehabilitation for improvements in static and dynamic balance in a patient with residual peripheral

Table 1: Initial, revaluation, and discharge scores on outcome measures

	Evaluation	Reevaluation 5 weeks	Discharge at 14 weeks	MCID or MCD
Activity Balance Confidence (ABC) scale	78%	74%	88%	MCID 18% for pt with vestibular disorders (7)
5 Times Sit-to-Stand (seconds)	13*	7.4	8.4	MCID 2.3 second for pt with vestibular disorders (9)
Functional Gait Assessment (FGA)	21/30*	21/30	28/30	MCID 4 points for pt with vestibular disorders (7) and older adults (8)
Gait speed (10-meter walk test)	1.0m/s	1.0m/s	1.15m/s	MCID 0.09 m/s for pt with vestibular disorders (7)
	SOT from previous therapy 2 years prior)		SOT at current POC discharge	
Sensory Organization Test (SOT) NeuroCom® Composite Score	Initial 42	Discharge 43	80	MDC for change due to intervention 8 points (10)

Abbreviations: MCID =Minimal Clinical Important Difference, MDC = Minimal Detectable Difference, pt = patients, *Cut-off score: Community dwelling elderly: >12 seconds on 5 Times Sit-to-Stand for further screening of balance (12), FGA < 22/30 predictive of risk of falls (13)

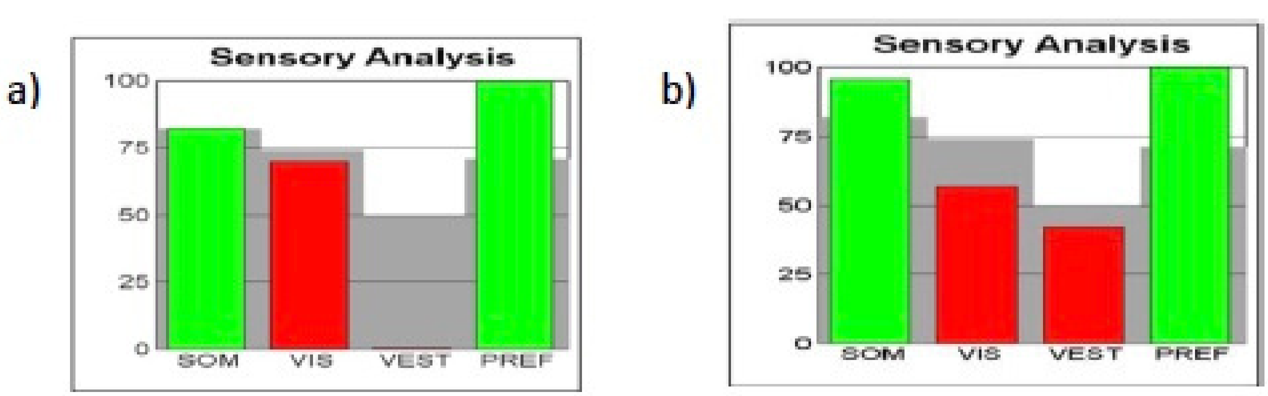

Figure 1: Sensory Organization Test results 2 years prior (a) and post-intervention (b)

neuropathy after GBS. Seventy percent of patients with GBS experience complete recovery; however, 30% will experience residual deficits in fatigue, pain, sensory changes, and muscle weakness.(3) To the author's knowledge, there's no report on vestibular rehabilitation and its impact on balance in someone with GBS. One study reported vestibular impairment in individuals with anti-GQ1b antibodies, such as GBS with ophthalmoplegia and Miller Fischer Syndrome; however, no recommendations regarding interventions were provided.(11)

Given the lack of objective progress on various balance and walking measures, reconsideration was taken to address balance via the vestibular system within the plan of care. While no specific vestibular complaints (i.e., dizziness, vertigo, etc.) were stated, it's been well documented in the literature that the vestibular system gradually reduces its function as a part of normal age-related changes.(4) The patient's multiple chronic sensory system deficits suggest that reweighting sensory processing may be an strategy to improve his balance. The interpretation of the outcome measures and their progress or lack thereof was discussed with the patient, and an alternative approach utilizing vestibular-based interventions to his care was agreed upon.

Following approximately six weeks of vestibular-based interventions, improvements were seen at discharge that were not seen at re-evaluation. Objective changes can be seen in both the ABC scale and the FGA that suggest overall confidence improved with balance and improved dynamic balance. The change in these outcomes is important for the patient as poor balance was his primary complaint and reason for searching for physical therapy.

What is interesting to note is the improvement in the SOT score. Although the mechanism that causes this change is unclear, this patient with GBS experienced a large change in SOT score after an intervention primarily targeting gaze stabilization exercises. The SOT measurements taken during a previous bout of physical therapy and post-discharge follow-up to the current plan of care. The 38-point improvement suggests vestibular upregulation positively impacted sensory reorganization compared to previous assessments when vestibular therapy was not implemented. A few studies have shown sensory reweighting with an increase in vestibular scores as measured by the SOT after gaze stabilization exercises in healthy adults (15) and adults with chronic subjective dizziness (16).

There are several limitations to this case report. The peripheral vestibular system was not directly assessed via a Head Impulse Test and/or Dynamic Visual Acuity. Therefore, it is unclear if a vestibular hypofunction was present. The SOT post intervention results can only suggest an upregulation or improved use of vestibular sensory information to maintain an upright posture. This single-subject report may not necessarily apply to all cases with GBS, especially those in the more acute stage of their disease. Further research is needed on the incidence of vestibular hypofunction and the effects of vestibular physical therapy in individuals with a history of GBS.

Conclusion

Vestibular rehab should be considered when working with persons with GBS who have balance deficits, especially in the chronic stage when sensorimotor recovery has likely plateaued.

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Recognition from CSM VRSIG Meeting

Vestibular SIG Research Award

Courtney Hall, PT, PhD

- Lead Author on the Vestibular Hypofunction Clinical Practice Guidelines
- Multiple Peer Reviewed Publications (12 in the past 5 years)
- Principle Investigator (PI) on a $2.5 million grant entitled: Rock Steady: A Mobile, Gamified Vestibular Rehabilitation Therapy App for Adults with Dizziness Related to mild Traumatic Brain Injury
- Co-PI on several other grants over $1 million
- Multiple Peer Reviewed Presentations

Applying Principles of Intensity Training to a Patient with Cerebellar Ataxia, Neuropathy, and Vestibular Areflexia (CANVAS)

Poster Summary: Presented at ICVR 2022

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Background

Cerebellar ataxia, neuropathy and vestibular areflexia (CANVAS) is a condition that impacts multiple systems related to balance control. It can be challenging for patients to receive this diagnosis, often taking over ten years after initial symptom onset for the condition to be identified. In general, CANVAS is considered more of a late-onset ataxia condition. The characteristics of CANVAS are three components: bilateral vestibulopathy, cerebellar ataxia, and somatic sensory deficits. Many patients, including the one discussed in this case, also describe a chronic cough. Some patients also report symptoms related to orthostatic hypotension and hypohidrosis. There appears to be a genetic component as there are documented cases impacting siblings and families across generations however, this is not yet fully understood.(1) Patients with CANVAS diagnosis can be referred to physical therapy to address imbalance and general mobility issues. Recent clinical practice guidelines highlight the benefits of intensity training to improve locomotor function in chronic stroke, incomplete spinal cord injury, brain injury, and Parkinson's Disease.(2) Patients with CANVAS also experience deficits in locomotor function, so they may benefit from intensity training.

Case Presentation

The patient is a 79-year-old male diagnosed with CANVAS who walks with a rollator and had six falls in 3 years. Physical therapy goals are to stop the progression of his disease and learn compensatory balance and eating techniques. The patient cycles at home for exercise with a three-wheeled bike a few times a week. Six-minute walk test (6MWT) was 966 feet (ft), Functional Gait Assessment (FGA) was 13/30, 5 time sit to stand was 16 seconds, Dizziness Handicap Inventory (DHI) was 66/100, Activities Balance Confidence Scale (ABC) was 45.3%, 10-meter walk test self-selected speed (10MWT SS) was 0.78m/s, and 10MWT Fast Speed (10 MWT FS) 1.24m/s.

Intervention

Nine physical therapy sessions included: balance and functional training, strengthening, vestibular exercises, and intensity training (IT). For IT, the Karvonen formula targeted a 60-80% training heart rate and a rate of perceived exertion scale (RPE) of 6-8/10 for cycling or walking at home. Vestibular based exercises included VOR cancellation, VOR x 1 horizontal and vertical, and optokinetic exercises in sitting with the target at arm's length, seated cervical joint position exercises, and standing vestibular substitution exercises with a rollator. All vestibular exercises were performed in the clinic and at home.

Outcomes

After two months of home training for intensity, 10MWTSS and 10MWTFS improved significantly to 0.91m/s and 1.44m/s, respectively. The 6MWT improved by 145ft to 1111ft, just below the cut-off for minimal clinically important difference (MCID) for the geriatric population.(3) The ABC improved to 72%, demonstrating a significant change. The patient continues to be compliant and independent with the home program using the compensatory techniques he learned for activities of daily living, vestibular exercises, and his intensity training home program.

Discussion

Adding higher intensity training to a vestibular physical therapy program benefited this patient with CANVAS. The patient successfully implemented intensity training safely at home a minimum of three times a week with either cycling or walking with his rollator.

Clinical Relevance

Intensity training can be safely implemented and may benefit individuals diagnosed with CANVAS syndrome.

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The purpose of the publication is to disseminate clinically relevant information to our members who treat individuals who have vestibular related symptoms.

The editors of the TVPT will accept literature reviews, brief research reports, clinical perspectives, conference presentation summaries, and clinical case studies. Editors will support and mentor clinicians who wish to contribute clinical experience and knowledge in this forum. The editors invite members to suggest topics and guest editors with expertise in a targeted topic.

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