Article ▸ Vestibular Rehabilitation Therapy

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ABSTRACT

Background: The vestibular system includes the parts of the inner ear and brain that process sensory information. Patients who suffer from vestibular disorders often have problems with controlling balance, spatial orientations, vertigo, dizziness, and eye movements. Vestibular Rehabilitation Therapy is a form of physical therapy that uses specialized exercises in order to achieve gaze and gait stabilization, improving patient comfort and quality of life. This case report will highlight a patient with Meniere's disease and several of the activities used to alleviate her vertigo.

Case Report: A 37-year-old female suffering from vertigo secondary to Meniere's disease was referred by her neurologist due to her vision complaints. The visual consequences along with her dizziness had left her incapable of performing her activities of daily living. Her Dizziness Handicap Inventory score and Dynamic Gait Index scores were 84 (>54 denotes a severe handicap) and 21/24, respectively. Through a program of vision therapy, the patient's symptoms were reduced, and she could begin to participate in many activities of daily living.

Conclusion: With the help of specialized testing, optometric vision therapy, and vestibular rehabilitation therapy, the patient was able to alleviate her symptoms and integrate back into society to live her life to the fullest.

Keywords: Meniere's disease, vestibular rehabilitation, vertigo, vision therapy

Introduction

Vestibular Rehabilitation Therapy (VRT) is a form of physical therapy that uses specialized exercises in order to achieve gaze and gait stabilization. Most VRT exercises involve head movement, which is essential in stimulating and retraining the vestibular system. A common complaint for people with vestibular disorders is that they have difficulty with their vision. The reason for this is that the vestibular system sends signals to the muscles of the eye through an autonomic function called the vestibuloocular reflex (VOR).[1] The main purpose of the VOR is to maintain stable fixation on objects, allowing visualization of objects clearly during brief head movements. If either becomes disrupted, it can throw off the balance between the two systems, becoming problematic for the patient. This case report integrates both optometric vision therapy and VRT for a patient who suffered from vertigo secondary to Meniere's disease.

Case Report

Angela was a 37-year-old female who suffered from vertigo and was diagnosed with Meniere's disease in March 2010. She worked as a receptionist in a two-story building. Her initial complaint during the vision therapy evaluation was that the vibrations on the second floor at her work were triggering her onsets of vertigo. Additionally, she had decreased focus and balance and experienced visual disturbances that made her dizzy. When she suffered from

Table 1. Initial Examination Findings

Visual Acuity @ D sc	20/25 OD, OS; 20/25 OU
Visual Acuity @ N cc	20/20 OD, OS, OU
EOMs	(-) restrictions, (+) head movement
Maddox Rod 40cm	small exo, no vertical phoria intermittent discomfort (ear pain) on pursuits, but smooth and accurate
CVF	FTFC OD, OS
Pupils	ERRL (-) APD
Refraction	+0.25-1.00x060 OD, +0.25-1.25x135 OS, +1.25 Add BCVA: 20/20, 20/20
Tonometry	16mmHg OD, OS
CT	4XP @ near; ortho @ distance
NPC	TTN x 3
NRA/PRA	+1.50/-2.50
Random Dot/Wirt Stereo	30 sec of arc
Vergences @ Near	BI: x/14/10; BO: x/8/4 **All vergence testing caused her to experience dizziness and discomfort
Dizziness Handicap Inventory score	84 (>54 denotes a severe handicap)
Dynamic Gait Index score	21/24 (<15 denotes a severe fall risk), with lowest scores in Gait Level Surface, Gait and Pivot Turn, and Steps
Ant and Post Seg	Unremarkable OD, OS

vertigo, the room appeared to spin, and she could not make it stop. It was always followed by a migraine. During her migraines, she would lose her balance and fall to the ground, taking several minutes to be able to pick herself up. As a result, Angela rarely felt comfortable unaccompanied for fear that she would fall.

After the case history, a comprehensive examination was performed (Table 1).

Following the vision therapy evaluation, two additional pieces of testing were performed. This included the Dizziness Handicap Inventory (DHI) and the Dynamic Gait Index (DGI; Appendices A and B). The DHI was administered first. The patient is asked to answer each question as it pertains to dizziness or unsteadiness problems. The questions are designed to incorporate functional (F), physical (P), and emotional (E) impacts on disability. To each item, the following scores can be assigned: No=0; Sometimes=2; Yes=4.[2] The scores are added together and assigned a handicap: 16-34 Points (mild handicap); 36-52 Points (moderate handicap); 54+ Points (severe handicap). After compiling the patient's DHI scores during this encounter, she scored an 84.

After she finished the inventory, she was asked to perform the DGI. The DGI examines the likeliness of falls based on a patient's current state. Furthermore, the DGI is broken down into eight categories, including (1) gait level surface, (2) change in gait speed, (3) gait with horizontal head turns, (4) gait with vertical head turns, (5) gait and pivot turn, (6) step over obstacle, (7) step around obstacles, and (8) walking up and down stairs.[3] Each category has a normal, mild, and severe impairment category. Based on how a patient performs, points are assigned to whatever category matches their performance the best. A score of less than 15 denotes a severe fall risk. This patient scored 21/24 points. Therefore, a potential fall risk was eliminated as a concern.

In order to address the dizziness, the treatment plan began with two sessions of optometric vision therapy to help address the vestibulo-ocular system, and then a progress check was scheduled after four weeks of home-based activities to assess daily symptoms. I made sure to educate the patient that, if successful, the optometric vision therapy sessions might not completely fix all of her symptoms, but they may improve her overall quality of life. The patient seemed receptive to the information, and she was thankful for the opportunity and eager to start the therapy sessions.

At the first vision therapy session, two procedures were performed. The first one was Greenwald Eye Movements.[4] This procedure was done to provide the patient with the opportunity to improve head and eye movements. These movements help the patient explore all the degrees of freedom that should exist between eye movements with head movement, eye movements without head movement, and in both types of movements, with and without, the influence of the vestibular apparatus by changing head positions. To start Greenwald Eye Movements, we began by using a Marsden ball that was swinging at eye level. The patient was patched, and without moving her head, she was

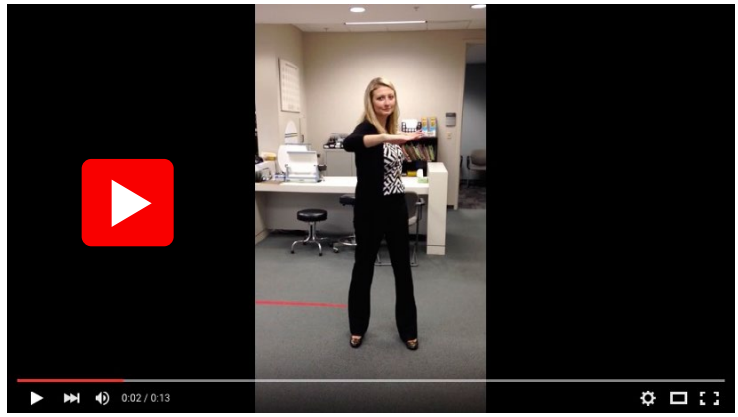
Figure 1. *First position for Greenwald Eye Movements*

Figure 2. *The head back position for Greenwald Eye Movements*

instructed to follow the swinging ball with her eyes only (Figure 1). She was then asked to follow the ball with her head, keeping her eyes fixed. The patient then tilted her head back (Figure 2) and turned her head to the left and right while following the ball. The Marsden ball was also sent home with the patient for homework. The second activity done was the VOR stimulation worksheet. The patient was directed to navigate her way through the maze with her eyes while shaking her head left and right or up and down in the direction she was moving. This was sent home with the patient as well.

After the first week of vision therapy, the patient reported significant dizziness with the activities. Patients with visual-vestibular interactions should be warned prior to prescribing the exercises that this may happen. If they are not aware of this prior, some may opt out of vision therapy altogether. However, she was less dizzy during the second week. The patient indicated that she had practiced walking around her house without holding onto or reaching for anything for balance. She stated that she was feeling better than she had in a long time and that normal activities were getting easier for her.

The patient returned for her second vision therapy session two weeks later. At that session, three procedures were performed: Twirling Robots, Robot Zapping, and Dusting off Moon Boots. All activities were derived and modified



Twirling Robots procedure.

Robot Zapping procedure.

Dusting Off Moon Boots procedure.

Figure 3. *The starting position for Robot Zapping*

Figure 4. *The patient rotates her body and touches fintertips with the therapist and turns back.*

Table 2. Progress Evaluation Findings

Visual Acuity @ D sc	20/20 OD, OS; 20/20 OU
Visual Acuity @ N cc	20/20 OD, OS, OU
EOMs	(-) restrictions, (+) head movement Much less head movement than on initial presentation. Patient noted a difference on follow-up
CVF	FTFC OD, OS
Pupils	ERRL (-) APD
CT	4XP @ near; ortho @ distance
NPC	TTN x 3
NRA/PRA	+1.50/-2.50
Vergences @ Near	BI: x/14/10; BO: x/15/8 Patient was able to sit for vergence testing without getting nauseous
Dizziness Handicap Inventory score	49 (>54 denotes a severe handicap)
Dynamic Gait Index score	21/24 (<15 denotes a severe fall risk), with lowest scores in Gait Level Surface, Gait and Pivot Turn, and Steps
Ant and Post Seg	Unremarkable OD, OS

from the Astronaut Training Vestibular Book.[5] This book is filled with visual-vestibular protocols for moving, looking, and listening. Each one of these procedures required the patient to move her head and to keep her eyes fixed or vice versa. Robot Zapping had the patient stand back to back with the doctor (Figure 3). The patient was required to rotate her body, touch her fingertip with the doctor's fingertip, and rotate back (Figure 4). The patient would turn to her right and to her left to touch, as well as touch fingertips over her head and between her legs. During this procedure, the patient's head should tilt backward fully when her hand is overhead and tilt forward and down fully when her hand is reaching towards her feet.

Twirling Robot had the patient spin from side to side. The patient was told to find a visual target and be "aware" of it but not to fixate on it when spinning. We had the patient perform ten "twirls" in each rotation. Dusting off Moon Boots required the patient to bend down and touch her toes, while alternating hands. Ball Games and Wall Saccades were also done at that session. She was sent home with all of the activities and told to work on the home therapy and gauge her symptoms over the course of the next few weeks.

When the patient returned for a follow-up three weeks later, she stated that all of the home activities were going well and that she felt the best she had in quite some time. The patient reported that her migraines had lessened, and that she was gaining more confidence in her ability to walk free of assistance. Examination findings are listed in Table 2. The patient also reported that the homework and vision therapy activities were no longer making her nauseous the way they did at the first therapy session.

With the help of the therapy, she was able to reconsider going back to work since she felt that she had better control over her dizziness. She was scheduled for further optometric vision therapy sessions, at which we will continue to address tracking, eye movement control, spatial orientation, and gait stabilization.

Discussion

Vestibular Rehabilitation Therapy is an exercise-based program designed to promote central nervous system compensation for inner ear deficits. When the vestibular organs are damaged, the brain can no longer rely on them for information about balance and equilibrium.[5] A common complaint for people with vestibular disorders is that they have a number of visual consequences. This is because of the vestibuloocular reflex (VOR). The VOR is controlled by three mechanisms: the semi-circular canals, the otolith system, and cervical input. When there is movement of the head, there is an equal and opposite eye movement (doll's eye movement). This keeps the visual world single, prepares for the next visual sensation, and prevents confusion. Some of the different types of vestibular disorders are BPPV (Benign Paroxysmal Positional Vertigo), dizziness, vertigo, motion sickness, and Meniere's disease.

Meniere's disease is a disorder of the inner ear that causes severe dizziness, tinnitus, hearing loss, and a feeling of congestion in the ear. It is believed to be caused by a buildup of endolymph in the labyrinth. This interferes with the balance and hearing signals and leads to vertigo and other symptoms that these patients experience. The dizziness spells can either be sudden or follow a prodrome which includes muffled hearing or ringing in the ears. In some patients, as in Angela's case, their vertigo causes them to lose balance and to fall. These are called "drop attacks."[6]

Some of the visual disturbances that might be experienced by the patient are difficulty tracking objects, objects may appear doubled, discomfort from busy visual environments, migraines, sensitivity to light, poor depth perception, and/or difficulty navigating in the dark.

In-office Optometric Vision Therapy is a viable treatment option to help relieve some of the visual disturbances that are experienced by the patient. Vision Therapy is a series of guided activities that teaches the patient how to move their eyes free from the rest of their body. This is done by training the patient to minimize head movements and by working on maintaining stable fixation of objects. By training the visual system to guide movement and direct action, we are helping to eliminate a lot of the visual symptoms involved in the visual vestibular interactions. Other interventions involve medication, dietary strategies, home based exercise, and some minor surgical procedures.

Conclusion

Vision Therapy and Vestibular Rehabilitation Therapy are no strangers. If a patient has complaints of dizziness, vertigo, and/or motion sickness, Vision Therapy should be considered as an option for these patients. The links between the ocular and vestibular systems are intertwined, and when you work one, you are almost always indirectly working the other.

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