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Physical therapy in vestibular disorders

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Vestibular disorders can be commonly divided into four categories: peripheral vestibular disorders, central vestibular disorders, combination of peripheral and central vestibular disorders, and psychiatric disorders. The primary symptoms of vestibular dysfuction are vertigo, which is an illusion of motion (usually spinning), and postural instability. To some patients, traditional interventions such as medication and surgery may offer limited improvement. The persistent of the symptoms limits their functional activities and leads to disability and poor quality of life.

Vestibular rehabilitation has been documented to be an effective and non-invasive approach for the management of vestibular symptoms. The treatment plan consists of individually designed set of exercises that address the unique needs of each patient. Vestibular rehabilitation uses specific exercises to enhance adaptation within the vestibular system, and to decrease symptoms of dizziness, visual difficulty and postural instability.

For today's lecture, only peripheral vestibular disorders will be addressed.

Initial assessment

It is essential that patients entering a therapy program have a validated diagnosis of vestibular pathology and have no evidence of a progressive process. Four simple steps of initial assessment are history taking, oculomotor function assessment, motion sensitivity testing, gait and balance.

1. History taking

This is necessary when patients come to see a therapist for the first time. Physical therapist should ask patients to describe the onset, character, frequency and duration of dizziness as well as events provoking or relieving the symptoms. The obtained information gives you an idea on pathology of vestibular disorders.

2. Oculomotor function assessment

These simple clinical tests help differentiating peripheral from central vestibular problems.

2.1 Spontaneous nystagmus

This is tested by having the patient look straight ahead. Three features of nystagmus used to separate peripheral from central vestibular disorders are direction, effect of fixation and effect of gaze. Nystagmus due to a central lesion does not change with the effect of fixation and gaze, and is generally uniplanar.

2.2 Clinical tests of vestibulo-ocular reflex function (VOR)

2.2.1 Head thrust test

Ask the patient to fixate on your nose and observe the eyes as you slowly rotate the head and then quickly thrust it. A corrective saccade indicates vestibular loss on the same side of head thrust.

2.2.2 Dynamic visual acuity test

First, use a snellen chart to measure a static visual acuity. Then, ask the patient to read the smallest possible line on chart while shaking the head at 2 Hz. Worsening of visual acuity by 3 or more lines above the initial static test is an indication of bilateral vestibular loss.

2.3 Eye movement

2.3.1 Smooth pursuit and VOR cancellation

Smooth pursuit is an ability to keep the image of a moving target on the fovea.

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A patient is asked to slowly track therapist's finger both horizontally and vertically while keeping the head still. Catch-up saccades will be observed when the target moves towards the side of lesion. This is suggestive of central lesion. For a test of VOR cancellation, the head is moving synchronously with the target. A horizontal nystagmus will occur when moving towards side of lesion.

2.3.2 Gaze holding nystagmus

During smooth pursuit testing, pause the finger briefly at the end point and observe for nystagmus. Be sure to keep the finger 18-24 inches away from the patient's face.

2.3.3 Saccades

Saccades are fast voluntary eye movements aiming to change direction of looking. This is tested by having the patient to quickly shift gaze between therapist's nose and finger held 20 degrees eccentrically in right, left, upward and downward directions. More than 2 saccades overshooting or undershooting the target indicates a central lesion.

3. Motion sensitivity testing

Patients with vestibular disorders often experience balance and dizziness problems when they perform their functional activities. Physical therapist must identify the head and trunk motions provoking the symptoms and document, if any, changes in lifestyle.

3.1 Dix-Hallpike test

This test assists in identifying the side of posterior/anterior canal and form of Benign Paroxysmal Positional Vertigo (BPPV). Physical therapist should explain the procedure to patients and inform them that they possibly feel dizzy during the test.

- Ask the patient to sit on bed facing the therapist.
- Turn the head 45 degrees toward the suspected side of lesion and rapidly move the patient into a supine position with the head extending 30 degrees. Observe for nystagmus. Patients with BPPV must have nystagmus. If the patient only reports dizziness but no nystagmus occurs during the test, he or she does not have BPPV.
- Wait till nystagmus stops and slowly bring the patient back into sitting up. Repeat to the other side.

3.2 Roll test

This is a specific test for the horizontal canal BPPV. As the procedure activates both horizontal canals, vertigo and nystagmus may occur in both head positions. The affected side is presumed to be the side that provokes the most symptoms.

- The patient is in a supine position with head elevated 20 degrees.
- Quickly turn the head 90 degrees to one side and keep in that position for 1 minute. Observe for vertigo and nystagmus.
- Bring the head back to midline and quickly turn it 90 degrees to the other side. Again, observe for vertigo and nystagmus.

3.3 Motion sensitivity testing

This test is developed by Shepard and Telian in 1995 and can be used as a basis for establishing a customized exercise program. There are a total of 16 activities including sitting to supine, supine to sides, supine to sitting, left and right Dix-Hallpike, getting up from left/right side, sitting with head tipped to each knee, bringing head up from each knee, sitting with head turn or pitch, and turning 180-degree to sides. The test should begin from an easy task and progress to more difficult ones. Only 3 to 4 tasks can be evaluated at one time as they may aggravate the symptoms.

4. Balance and gait

4.1 Balance test

Both static and dynamic balance skills are assessed. A test of sensory interaction on balance is performed to evaluate the patient's ability to use vestibular inputs for orientation when

deprived of other sensory inputs. In addition, the patient's use of appropriate movement strategies in balance control is examined.

4.2 Gait

Many patients with vestibular dysfunction are afraid to walk as they feel unstable and fear of fallings. Ask the patient to walk at different speeds and look for any deviations such as a widened base of support, slow speed, shortened step length, and veering to sides.

Treatment Approach

Major goals of treatment include reducing the motion-provoked symptoms, improving functional balance and gait, and enhancing the patient's ability to see clearly during head movement.

1. Reducing the motion-provoked symptoms

1.1 Canalith Repositioning Treatment (CRT)

The purpose of the canalith repositioning is to remove debris from the canals. Physical therapist should go through each step slowly and wait till the nystagmus stops before performing the next step.

1.1.1 Epley maneuver or CRT for posterior/anterior canal

- First, bring the patient into the Dix-Hallpike position toward the affected side. Keep the position for 2 minutes
- Slowly turn the head 90 degrees to the other side. Hold there for 2 minutes.
- Assist the patient to roll onto the unaffected side (side lying position) while the head is still turned 45 degrees down toward the floor. Hold there for 2 minutes.
- Maintain the head turning position while helping the patients to sit up.
- In each position, observe for the nystagmus, wait till it stops before going through the next step.

1.1.2 BBQ roll or CRT for horizontal canal

- Start with the patient in a supine position. Turn the head toward the affected side, wait for 2 minutes and bring the head back to midline.
- Roll the head 90 degrees to the other side. Wait for 2 minutes. Then ask the patient to roll onto the unaffected side.
- Have the patient lie on the stomach. If the treatment is successful, the patient should have no nystagmus or vertigo in this position.
- Turn another 90 degrees to lie on the affected side.

1.2. Liberatory maneuver

This maneuver is more aggressive than the CRT as its purpose is to dislodge the debris from the cupula.

For posterior canal:

- The patient sits with legs over side of the bed.
- Turn the head 45 degrees to the unaffected ear and bring the patient into side-lying position with the affected ear down. Hold the position for 3 minutes.
- Rapidly move the patient up to the sitting position and down into side-lying position with the face pointing downwards. Nystagmus and vertigo typically appear in this position. Hold the position till the symptoms subside. Slowly bring the patient back to the sitting position.

1.3. Habituation exercise

The series of exercise that provoke dizziness and imbalance can be used to customize the program for each individual. The movement should start with easiest to hardest and up to 4 tasks. The patient must experience moderate but tolerable dizziness that lasts less than 1 minute when performing the tasks. Ask the patient to do it at least once a day with 3 to 5 repetitions.

2. Improving functional balance and gait

Patients often complain of dizziness and disequilibrium when they perform their daily

activities. Physical therapist must design an exercise program that alters or even removes visual and/or somatosensory inputs so the patient learns to use the remaining cues. For gait training, the basic parameters to be considered are distance, direction, base of support, and head motion. With progression, ask the patient to do more functional tasks such as reaching, picking up objects from floor, stepping up and down, body perturbations, being nudged or pulled and real life practice.

3. Enhancing the patient's ability to see clearly during head movement.

3.1 VOR exercise

• Tape a card with the letter "X" on the wall about 1 meter away. Have the patient focus on the letter and move the head from side to side as quickly as possible 20-30 times.

• The amount of head rotation can be small but the letter must stay in focus. The exercise should bring a moderate amount of dizziness that decreases to resting level after 15 to 20 minutes.

• The head can also be moved vertically and diagonally. Progress from sitting to standing with the feet shoulder width apart to standing with the feet together or from standing on a firm surface to standing on a compliant surface.

3.2 Tracking exercise

• Have the patient hold a card with the letter "X" at arm's length and then move it left and right across the visual field while tracking with eye movement and keeping the head still. Repeat the full cycle 20-30 times. Perform the test in the vertical and diagonal directions as well, increasing speed but being certain to keep the letter in focus.

3.3 Saccade exercise

• Hold a card with letter "X" in each hand approximately 15 inches apart at arm's length. Keeping the head still, quickly move the eyes back and forth from card to card, 1 second per card. Repeat 20-30 times for the complete cycle. This test also can be performed in the vertical and diagonal planes.

Conclusion

Physical therapy in vestibular disorders serves well as an additional treatment to the traditional interventions. The individually customized exercise program not only helps the patients regain their functional activities but also lowers the recurrent rate. There is a growing evidence that individuals with vestibular disorders can expect good recovery after the rehabilitation.

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