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### LABYRINTHINE EXERCISES (4/14)

The balance system of the inner ear and brain can be damaged in many ways. Viral infections (labyrinthitis and vestibular neuronitis), disorders that affect the fluid levels in the inner ear (Meniere's disease and endolymphatic hydrops), trauma from head injury, benign tumors (acoustic neuroma), and degeneration of the balance organ cells with aging can all cause permanent damage to the balance organ or balance nerve.

When the balance system is damaged, it has little ability to repair itself. The body recovers from injury by having the part of the brain that controls balance recalibrate itself to compensate for the unmatched signal being sent from the damaged and well ears. This compensation process occurs naturally in most people. Some people require help from vestibular rehabilitation therapy in order to recover from an injury to the balance system.

#### **Acute (Immediate) compensation**

When a sudden injury occurs to one side of the balance system, the patient may feel very sick for hours to a few days with a spinning feeling, unsteadiness, lightheadedness, and often sweating, nausea, and vomiting. This is because the signals being sent from the two balance organs are no longer equal and opposite, and the brain interprets the difference as constant movement. The patient may also report dizziness or blurred vision with movements. Vision and proprioception (the sense of pressure at the bottom of the feet) are also used to maintain balance, so the patient can walk but will feel unsteady and may fall in the dark or on soft or bumpy floors like thick carpet, grass, or gravel.

At this point, most patients are well enough to get out of bed and visit a doctor. The doctor sees a person who is not spinning but whose gait is unsteady. If the patient is not given an opportunity to clearly describe what has happened, he or she may be immediately referred to neurology to rule out stroke because of this unsteady gait.

#### **Chronic (long-term) compensation**

During the acute compensation phase, the cerebellum slowly allows more signals from the balance organs to pass to the balance areas of the brain. As the brain receives these signals, it fine-tunes the mathematics performed to interpret the information, in order to account for the difference between the ears. The brain must receive signals from the balance organs to be able to modify its interpretation of these signals.

For most patients, the movements made during normal daily activities are enough to achieve chronic (long-term) compensation, usually in two to four weeks after the injury has occurred.

Once the chronic compensation process is complete, the patient is essentially symptom-free. If unsteadiness and/or motion provoked dizziness persist after that time, compensation is not complete and the physician may prescribe a program of vestibular rehabilitation therapy (VRT).

VRT is a treatment program administered by a specially trained physical therapist. It is designed to provide small, controlled, and repeated 'doses' of the movements and activities that provoke dizziness in order to (1) desensitize the balance system to the movements, and (2) enhance the fine-tuning involved in long-term compensation. VRT can be self administered, but is most effective when administered by a physical therapist that has special training in this unusual form of therapy.

#### **Decompensation**

It's important to remember that even after the symptoms goes away, the balance system remains injured, and the brain has simply adapted to the injury. For many patients, dizziness will return months or years after compensating for a balance system injury. It is critical for the physician to find out what type of dizziness the patient has. If the patient describes another severe attack of spinning with unsteadiness and nausea lasting hours to days, this suggests that a second injury has occurred to the balance system, such as another viral infection or an attack of Meniere's or endolymphatic hydrops. These conditions require diagnosis and medical treatment. If the patient reports that dizziness occurs after particular movements, and lasts seconds to a few minutes, this suggests decompensation. Decompensation simply means that the brain has 'forgotten' the fine-tuning procedure it developed during the chronic compensation phase described above.

Events that can provoke decompensation include a bad cold or flu, minor surgery, long vacations, or anything that stops normal daily activity for a few days. Recovery after decompensation is exactly like the recovery that occurs during the chronic compensation phase.

Movements and activities are the stimuli the brain needs to fine-tune the system. We routinely counsel patients to keep their VRT exercise program instructions in a drawer even after they recover so that they can begin the exercises immediately if symptoms return.

Usually recovery after decompensation is quicker than the recovery after the initial injury to the balance system.

### **Failure to compensate**

Two things are required in order to compensate for an injury. First, the brain must receive signals from the balance organs. This means that movements must not be avoided, because movements create the signals the brain needs to compensate for the injury. Secondly, the balance areas of the brain must be capable of change.

During the early stages of dizziness, many physicians counsel their patients to avoid quick movements and reduce their activities. Most patients will be prescribed one or more anti-dizziness medications such as *Antivert* (meclizine), *Valium* (diazepam), *Ativan*, *Xanax*, *Phenergan*, *Compazine*, and *Zofran*. This is fine during the acute stages of a dizziness problem in order to reduce the dizziness symptoms that persist for hours or days even when the patient is not moving. However, once the acute phase is past, inactivity and medications can interfere with the long-term compensation process. Any medication that makes the brain sleepy, including all of the anti-dizziness medications, can slow down or stop the process of compensation, so they are often not appropriate for long-term use. Most patients who fail to compensate are found to either be strictly avoiding certain movements, using anti-dizziness medications daily, or both. Treatment includes VRT, gradual reduction, and eventual elimination of these medications.

Brain damage caused by stroke, head injury, etc., can slow down or stop the natural compensation process. It is difficult to predict which patients with brain injury will improve or how much, so all patients should be given the chance to improve through a VRT program. As long as a patient continues to show improvement, even if it is gradual, treatment should be continued.

### **Aims of exercise**

- To loosen up the muscles of the neck and shoulders in order to overcome the protective muscular spasm and tendency to move “in one place”.
- To train movement of the eyes, independent of the head.
- To practice balancing in everyday situations with special attention to developing the use of the eyes and the subcutaneous and kinesthetic senses.
- To practice head movements that cause dizziness, and thus gradually overcome the disability.
- To become accustomed to moving about naturally in daylight and in the dark.
- Generally, to encourage the restoration of self-confidence and easy spontaneous movement.
- All exercises are started in exaggerated slow time and gradually progress to more rapid time. The rate of progression from the bed to sitting and then to standing exercise depends upon the vertigo of each individual case.

### **Labyrinthine Exercises**

Exercises to be carried out for 15 minutes 2-3 times a day, increasing to 30 minutes.

#### **EYE EXERCISES**

Looking up, then down-at first slowly, then quickly. 20 times.

Looking from one side to the other-at first slowly, then quickly. 20 times.

Focus on finger at arm's length, moving finger one foot closer and back again. 20 times.

#### **HEAD EXERCISES:**

Bend head forward then backward with eyes open -slowly, later quickly. 20 times.

Turn head from one side to the other side -slowly, then quickly. 20 times.

As dizziness decreases, these exercises should be done with eyes closed.

#### **SITTING:**

While sitting, shrug shoulders. 20 times.

Turn shoulders to right, then to left. 20 times.

Bend forward and pick up objects from ground and sit up. 20 times.

#### **STANDING:**

Change from sitting to standing and back again. 20 times with eyes open. Repeat with eyes closed.

Throw a small rubber ball from hand to hand above eye level. 20 times.  
Throw ball from hand to hand under one knee. 20 times.

**MOVING ABOUT:**

Walk across room with eyes open, then closed. 10 times.  
Walk up and down a slope with eyes open, then closed. 10 times  
Walk up and down steps with eyes open, then closed. 10 times.  
Any game involving stooping or turning is good.

**SEMONT EXERCISE THERAPY FOR POSITIONAL VERTIGO**

The patient begins in the seated position and then leans rapidly to one side, placing the head on the bed or table. The patient remains there until the vertigo subsides and then returns to the seated upright position, remaining there until all symptoms subside. The maneuver is repeated toward the opposite side, completing one full repetition. Ten to 20 repetitions should be performed two times a day.

