Can My Balance Be Affected by My Hearing Loss?

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A lot of people are not aware of how confusing the ear anatomy is, especially when you think about the fact that the ear is responsible for more than just being able to hear. It is also responsible for our balance. The ear is composed of three different components: the outer, middle, and inner ear. All of these components work together to enable us to hear, but the inner ear is the only one that controls our balance.

The Outer Ear

There are multiple parts that make up the outer ear, such as the pinna, ear lobe and the external canal. Both of these structures are able to funnel the sound waves in the direction of the ear drum or toward the tympanic membrane, which is going to allow for the necessary vibrations. The pinna also helps to protect the ear drum from any potential damage. Ear wax is formed within the ear canal through sweat glands that have been modified.

The Middle Ear

Within the temporal bone of the skull you are going to find a space filled with air that is known as the middle ear. The Eustachian tube helps to regulate the amount of pressure within the middle ear. It ends up draining through your nose and throat, as well as through the nasopharynx. Next to the tympanic membrane there are three smaller sized bones, also known as ossicles. These three bones, called the malleus, stapes, and incus, are connected together in a chainlike fashion to the tympanic membrane to help convert all of the sound waves that go through the membrane. They form a sort of mechanical vibration out of the three smaller bones in the middle ear. The oval shaped window, which is considered the gateway to the inner ear, is composed of the stapes.

The Inner Ear

There are two separate functions for the inner ear. The first one is hearing and the second role is that of balance. There are numerous tubes inside of the ear that are filled with fluid. All of these tubes are surrounded by the temporal bone that composes the skull. Within those bony tubes there are also cell membranes that line the tubes. These tubes are known as the bony labyrinth that will be composed of a perilymph fluid. The labyrinth tubes are also filled with endolymph. It is in this part of the ear that the cells are located for our hearing.

The remaining components of the inner ear are the eighth cranial nerve and the round window. The eighth cranial nerve is compiled of the nerves that control hearing and balance.

Bony Labyrinth

There are three separate sections of the bony labyrinth.

â€¢ Cochlea â€“ This part of the structure controls our hearing.

â€¢ Semicircular Canals â€“ These canals are directly linked to our balance.

â€¢ Vestibule â€“ This structure connects the cochlea and the semicircular canals. There are multiple balance and equilibrium structures within this component, known as the saccule and the utricle.

Hearing

A lot of people often wonder exactly how the hearing process really works. Our ears will funnel the different sounds within the environment through the outer ear canal, which in turn will cause the tympanic membranes to vibrate. Those vibrations are then transferred into the ossicles for mechanical vibrations. It is the mechanical vibrations that allow the oval window to be able to move around, which in turn causes the perilymph in the inner ear to form motions that are like waves of sound. The fluid of the perilymph will then be sent to the endolymph where the wave motions are then formed into an electrical impulse that will be detected by the hairy cells of the Corti. They are then sent back to the brain through the cochlear nerve. It is the round window that is responsible for the absorption of the fluid wave vibrations to be able to release any increase in pressure for the inner ear that has been caused by the wave-like motion.

Balance

In order to maintain proper balance, our bodies are going to take a variety of sensory information from multiple organs. That process will then begin to let the body know where it is at in relation to the Earth and its gravity. The vestibular system in the inner ear will send the information to the brainstem, cerebellum and the spinal cord. The cerebrum in the brain does not need to provide a continual input for any potential balance problems to occur. If there is an abnormality in the vestibular signal, your body will try to compensate itself by making the necessary adjustments with your posture in the limbs and trunk of the body. This helps to make the necessary changes for your eye movement to give your brain the signals needed for sight.

In the inner ear there are three different canals that are all closely positioned against each other. These canals help to detect any changes in movement for your body. When there are changes that occur, the endolymph will create waves within the ear canal to promote movement at the base of the hair cells. The hair cells are able to sense what position your head is in through the utricle and saccule, which are then stimulated each time there is a change in the position of the head and the gravity needs to be readjusted.

Within each of the saccule and the utricle there is a small area of nerve fibers known as the macule. The macule for the saccule is positioned vertically; whereas, the macule for the utricle is positioned horizontally. Every one of the macules will contain bundles of fine hair that are covered by the otolithic membrane, which is almost like jelly and it is covered by a layering of calcium crystals.

It is the calcium crystals that will ultimately determine the position of the hairs and provoke the nerves to help create a change in position, as well as transmit the information to the cerebellum and the brainstem.

If there are abnormalities in the vestibular system, there may be different conditions including:

â€¢ Vertigo, which is the feeling that the room is spinning around you

â€¢ Meniereâ€™s Disease

â€¢ Labyrinthitis and

â€¢ Benign Paroxysmal Positional Vertigo

Some of the more common conditions that involve the inner ear canal include:

â€¢ Ear wax

â€¢ Swimmerâ€™s ear

â€¢ Otitis Media

â€¢ Tinnitus

â€¢ Cauliflower Ear

â€¢ Eustachian tube problems

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