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Age-Related Characteristics of Vestibular Neurons

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Abstract: The structure of the hearing organ. The hearing organ consists of three parts: the outer, middle and inner ear. If the first two parts perform auxiliary functions, then the perception of sound stimuli is carried out in the part of the inner ear called the cochlea. The function of the outer ear, which is formed from the punna and the external auditory canal, is to capture and transmit sound waves to the eardrum, with which synchronous vibration begins. There is a transmission mechanism in the middle ear - three auditory bones - malleus, incus and stapes, which are connected to each other in series. Their role is to reduce the amplitude of vibrations and increase their strength.

Key words: Vestibular analyzer, neuronit, vestibular analyzer age-related features.

The structure of the middle and inner ear.

Due to the auditory tube connecting the middle ear with the nasopharynx, the air pressure in this part of the hearing organ is exactly equal to the atmospheric pressure at any time. This allows the eardrum to vibrate freely.

The stirrup rests on a membrane that compresses the oval window of the inner ear. The inner ear is formed from a bony labyrinth located in the thickness of the temporal bone, in which there is, for example, a connective tissue membranous labyrinth, which basically repeats the contours of the bony labyrinth and is filled with endolymph.

The membranous labyrinth is formed by two bags of the vestibule, three mutually perpendicular semicircular canals from one bag, and the cochlea from the other (Fig. 16). The semicircular canals form the vestibular apparatus, which is not related to the hearing function.

Hearing receptors are located in the cochlea. A bony spiral plate emerges from the bony core of the cochlea, a spiral organ is located on its edge, and a spiral membrane is attached. It is formed by elastic fibers, including hair cells. Under the influence of tones of different heights, certain fibers vibrate, which causes irritation of certain hair cells, which are auditory receptors. These cells are approached by fibers of the auditory nerve that transmit impulses to the brain. Then, the impulses enter the auditory cortex located in the temporal lobe of the cerebral hemispheres. This is the cortical part of the auditory analyzer.

Here the analysis of auditory stimuli is completed. The human hearing organ receives sound vibrations in the air with a frequency of 16 to 30,000 vibrations per second.

Rice. 17. The structure of snails. The cochlea consists of three spiral canals filled with fluid. The spiral canal of the cochlea is limited by membranes that separate it from the scala vestibule and the tympanic canal. These canals are connected by a passageway called the helicotrema located at the top of the cochlea.

The anatomical structure of the hearing organ in children of primary school age is the same as that of adults. Even the size of its sections changes slightly with age. Only slight growth of the auricle and elongation of the auditory tube are observed.

However, children's hearing acuity is lower than that of adults. It grows gradually until 14-19 years. The threshold for hearing speech also changes significantly. It is higher in children of primary school age than in adults. The ability to distinguish fields depends on various reasons, including congenital characteristics. Musically gifted children, already at an early age, are able to accurately determine not only the pitch of tones, but also each of them. Such a musical ear is called absolute. Children's ear for music should be taught in singing lessons. This is one of the important conditions for the perfect formation of a person.

Impaired hearing. A child's hearing may be impaired due to congenital hearing loss, as well as due to past illnesses and injuries. One of the forms of this defect can be an overgrowth of the external auditory canal, which develops as a result of infection from the outside (scratching and collecting the ear with dirty objects, due to prolonged irritation of the skin of the external auditory canal). with discharge of pus from the middle ear) or as a result of injuries (bruises, burns of the walls of the external auditory canal).

Significant hearing loss can occur as a result of inflammatory processes in the nasopharynx, which occur with flu, sore throat and runny nose, and can spread to the auditory tube and close its lumen. This causes the middle ear to stop getting air, which reduces the mobility of the eardrum. The described disease is called catarrh of the middle ear and is especially common among children of preschool and primary school age.

Acute infectious diseases (flu, tonsillitis, measles, scarlet fever, etc.) can cause acute inflammation of the middle ear - otitis media. Symptoms of this disease are acute pain in the ear and fever. Pus accumulates in the middle ear, which puts pressure on the eardrum and can cause it to rupture, which can lead to significant hearing loss and sometimes deafness. Acute otitis media is more common in children than in adults. This is a life-threatening disease. Therefore, children who complain of ear pain are urgently sent to a specialist doctor.

Constant noise has a negative effect on the hearing system. Long-term noise, even if it is of low intensity, affects the child's nervous system, reduces his performance and academic performance, so avoid excessive noise in schools by any means, shouting during recess and other harsh it is very important to prevent sounds. .

Hearing-impaired children should be seated at the first desks in the classroom, and those who cannot follow the teacher's story because of their hearing should be sent to special schools for hearing-impaired children.

Features of the structure and function of the vestibular apparatus. The main mechanism that ensures orientation and balance in space is the vestibular apparatus. Anatomically, it is connected to the auditory organ and is formed by the vestibule and three semicircular canals. The vestibular apparatus is filled with endolymph.

In the vestibule there is a receptor apparatus containing hair cells. The free ends of these cells are immersed in a gelatinous mass containing calcareous otoliths. When the position of the head or the speed of body movement changes, the position of the otoliths changes, which causes irritation of the hair cells. Excitement occurs in them, which leads to a reflex change in the tone of certain muscles.

At the widened end of each semicircular canal there is also a receptor apparatus similar to those described above. With each change in body position, the direction of endolymph pressure is different.

Thus, both types of vestibular apparatus receptors send signals about changes in body position. These signals cause reflex contraction of the corresponding muscle groups.

If the function of the vestibular apparatus is disturbed, a person loses the ability to maintain balance. It is important to train the vestibular apparatus. Sports play a big role in these activities.

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