Nurov U.I., Khatamov J.A.

ACUTE AND CHRONIC EAR DISEASES

STUDY GUIDE

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The study guide covers the etiology and pathogenesis diseases of ear in the field of otorhinolaryngology, clinical manifestations and modern diagnosis, comparative diagnosis, surgical tactics of treatment. The study guide contains the necessary information that students need to learn theoretical and clinical skills. The publication focuses on the prevention of possible complications in the treatment of ear diseases. The study guide is recommended for postgraduate residents of medical universities, students of medical and professional education faculties.

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ABBREVIATIONS

1. **ENT**- Ear, Nose, Throat
2. **X-ray and CT**- Computed tomography
3. **MRI**- Magnetic resonance imaging
4. **dB**- decibels
5. **Gs**- hertz
6. **GBO**- hyperbaric oxygenation
7. **ATF**- Adenosine triphosphate
8. **ARD**- Acute respiratory disease
9. **CIS**- Commonwealth of Independent States
10. **UBI**- ultraviolet irradiation
11. **UHF**-ultra-high frequency therapy
12. **etc** - et cetera
13. **ARVI**-acute respiratory viral infection
14. **OAE** -otoacoustic emission
15. **SOAE**- Spontaneous otoacoustic emission
16. **EOE**-Evoked otoacoustic emissions
17. **DOAE**-Delayed Otoacoustic Emission
18. **SLAEP**-short-latency auditory evoked potentials
19. **MLAEP** -Medium-latent evoked auditory potentials
20. **CSF**-cerebrospinal fluid

INTRODUCTION

Ear- is the hearing organ of the human body, capable of transmitting and receiving sound waves caused by the vibrations of tiny air molecules. The ear hears low and high sounds equally, determines the behavior and position of a person in the environment and serves as his guard. Mechanical vibrations turn into electrical impulses in the organ of Kortiev, located in the inner ear Cochlea, and provide information to the brain about the frequency, strength, tone, and speed of sound vibrations.

Neurosensory nerve fibers in the inner ear have the ability to separate different sounds into types (pitch, timbre, hardness). A complex auditory analyzer can be better understood only when studying the evolutionary development of the human ear and the stages of its formation in the embryonic period.

The human ear begins to appear on both sides of the head as a thickened epithelium in the third week of the fetus. The circle at the center of this condensation rapidly grows inward and forms a depression. Then the cleft closes, creating a fluid-filled cavity called an otocyst. The otocyst later becomes the inner ear and forms the edges of the auditory and vestibular nerve fibers.

The tympanic membrane and the tympanic cavity emerge from the distal part of the primary wound. Its proximal part narrows and becomes the eustachian tube leading to the middle ear. The ectoderm, which is formed on the opposite side of the tympanic cavity, i.e., the external auditory canal, is formed later from the cleft. A similar cleft grows externally in the primitive human fetus and gives rise to the external ear, which protrudes from both sides of the head. In the human fetus, the cleft becomes a secondary bony chain. The first of these bones is connected to the handle of the hammer drum, and the second bone with its head forms a joint. On the other side, the sacrum forms an even smaller joint and connects with the small bony protuberance. The footplate of the stapes is placed over the oval window leading to the inner ear. Before the baby is born, the ear has its full shape and size. The otocyst develops into the fully complex fluid-filled labyrinth of the inner ear.

First, three semicircular canals are formed. Later, an elongated sac called the endolymphatic sac appears. Vestibular nerve endings begin to appear after 7-8 weeks of pregnancy. The organ of hearing develops much later, auditory nerves begin to appear in the 12 th week of the fetus.

In the 5th month of the fetus, the semicircular canals of the labyrinth of the inner ear, the vestibule and the cochlea are fully developed. The outer and middle ear are fully formed in the seventh month, two months before the birth of the child. The human ear, like the ear of other mammals, consists of three main parts (the outer ear, the middle ear, and the inner ear).

I. EAR CLINICAL ANATOMY, PHYSIOLOGY, EXAMINATION METHODS

1.1 Clinical anatomy of the external ear

The human ear consists of three outer, middle and inner parts: The outer ear consists of the pinna and the external auditory canal.

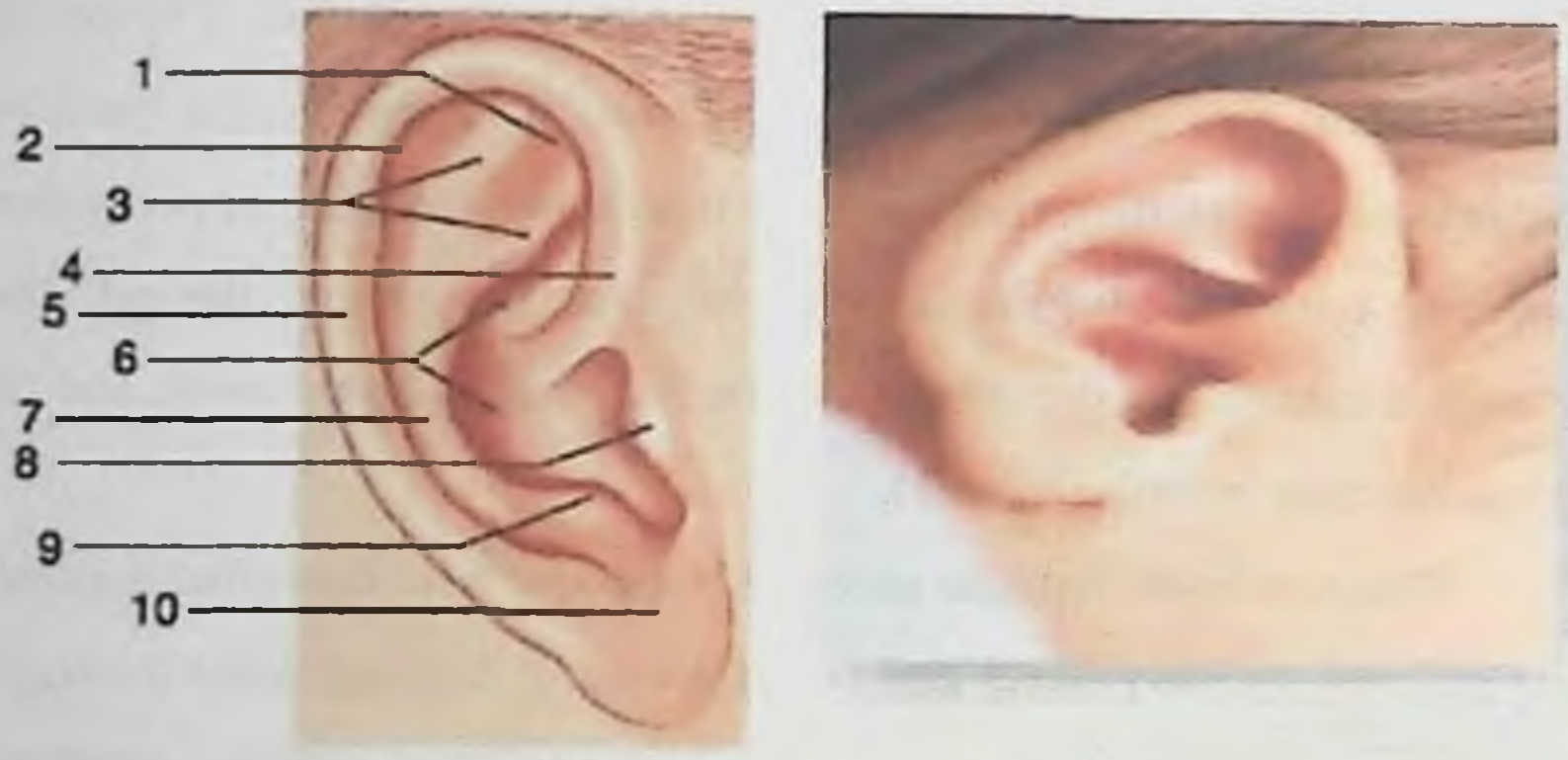
Supra ear (auricula) has a complex conPicuration, it is divided into two parts: the auricle, which is an increase of the skin with fatty tissue, and a part consisting of the ear, which is covered with thin skin. If it is possible to form folds on the back surface of the skin, then on the front surface it is impossible to do this due to the tight connection of the skin with the upper surface. The auricle contains the interaural groove, the tympanic membrane, the peduncle, the lower peduncle of the opposite tympanic membrane, the triangular fossa, the upper peduncle of the opposite tympanic membrane, the tympanic membrane, the pit, the opposite tympanic membrane, the entrance to the external auditory canal, and the opposite tympanic membrane. . (Pic.1.1).

Pressure in the supacha area can be painful with the inflammatory process in the external auditory canal and in children due to acute otitis media, because in early childhood there is no bone section in the external auditory canal and therefore it is shorter. In these cases, pressure on the eardrum actually puts pressure on the inflamed eardrum with increased pain. In addition to these growths, there are depressions called fossa triangularis and scapha on the front surface of the supra.

In order to determine the localization of some processes in the area of the auricle, it is necessary to know about hematomas in the area of the triangular fossa, an abscess of the auricle and other elements of the ear. The height of the auricle usually corresponds to the length of the back of the nose. A deviation in one or another direction allows us to speak of micro or macrotia. The fact that the auricle is located at a distance from the surface of the skull and has blood supply properties (vessels on the front surface of the ear are not surrounded by subcutaneous tissue) creates conditions for freezing, because the vessels are in a state of spasm under

the influence of cold. The auricle plays an important role in ototopy, that is, the ability to determine the direction of the sound source, it has a protective function. Due to its complex structure, the normal eardrum helps to trap dust particles in the outermost part of the external auditory canal.

With a deformed (or completely missing) cochlea, dust reaches the drum curtain and can settle on it and contribute to the development of inflammation. The auricle affects hearing acuity to a certain extent, so when a person puts his hand to his ear in order to perceive a weak sound, he behaves as if he increased the area.



Picture. 1.*The structure of the auricle: 1 – triangular cavity; 2 - recess; 3 - the leg of the opposite leg; 4 – the foot of the gajak; 5 - gajak; 6 – supra cavity; 7 - opposite gajak; 8 - bench; 9 - the opposite bench; 10 – soft ear*

External auditory canal– (meatus acousticus externus) is slightly bent. This path starts from the bottom of the auricle and merges with the tympanic membrane and ends. The auricle, narrowing in the form of a funnel, passes into the external auditory canal, which consists of two parts - the external membranous auricle and the internal bone. (Picure 2). The diameter of the external auditory canal is different, but this does not affect hearing acuity. In children under one year, there is no bony part of the external auditory canal, and only the part that descends to the

ear. The length of the external auditory canal in children is 0.5-0.7 cm, and in adults it is 3 cm.

Picture. 2.External auditory canal.

The part of the external auditory canal, which is partially formed by the tissue that descends to the ear, is bounded below by the capsule of the pre-auricular salivary gland. On the lower wall there are several transverse cracks in the tissue that descends to the ankle. Through them, the inflammatory process can spread to the parotid gland. In the area of the ear, there are many glands that produce earwax, hair with hair follicles that can be inflamed, and as a result of the penetration of pathogenic flora, a furuncle of the external auditory canal appears.

The external auditory meatus consists of a cochlear tube. This trachea is open in the area of the posterior-superior wall, therefore, in order to prevent the occurrence of perichondritis, during ear surgery, incisions of the ear canal should be made exactly along the superior posterior wall.

The front wall of the external auditory meatus is closely connected with the temporomandibular joint and this wall moves with each chewing movement. In cases where a boil appears on this wall, every chewing movement increases the pain. The close connection of the external auditory canal with the temporomandibular joint, in an injury to the chin, causes a fracture of the anterior

wall of the external auditory canal with skin rupture and possible scar obliteration of the external auditory canal.

In addition, the close anatomical connection of these formations explains the occurrence of some syndromes related to otorhinolaryngology and dentistry. The bony part of the external auditory canal is covered with thin skin, and there is a narrowing (isthmus) at the border with the ear canal. The advancement of foreign bodies behind this constriction makes it much more difficult to remove them by any means.

The upper wall of the bone part is limited by the middle cranial fossa, the back wall by the air cells of the mastoid tumor, especially the cave. This explains one of the signs of an acute inflammatory process (mastoiditis) of a mastoid tumor - the appearance of a symptom of skin hanging on the back-upper wall of the bony part of the external auditory canal.

The skin of the external auditory canal in the upper part is provided with hair, oil and sulfur glands. The latter release sulfur and serve as modified sebaceous glands. The skin in the bony part of the external auditory canal is thin, and it is an area free of hair and glands.

Blood supply to the external ear is provided by branches of the external carotid artery. The auricle is supplied with blood from the back ear and superficial neck arteries (a. auricularis posterior et a. temporalis superficialis). The same vessels, as well as the deep ear artery (a. auricularis profunda), supply the deep parts and the tympanic membrane with blood and form a tangle around the external auditory canal. The venous flow flows from the front into the back-inferior vein (v.retromandibularis) and from the back into the back vein of the ear (v. auricularis posterior).

The innervation of the external ear (the skin of the external auditory canal, the auricle) is carried out by the third branch of the trigeminal, vagus and glossopharyngeal nerves. This leads to the appearance of "reflected" pain, for example, with inflammation of the periodontal tissue of the lower tooth number 8, a strong pain may appear in the ear on the corresponding side.

Drum curtain– (membrana tympani myrinx) is in a slightly bent position, forms the end of the external auditory canal and is directed inward, in the form of a cone. Its edge is attached to the bone wall of the external auditory canal.

Until the child is two months old, the tympanic membrane is considered a continuation of the upper wall of the external auditory canal, so it is difficult to examine the ear of young children with a special instrument. When the child becomes an adult, the nogora veil begins to take a vertical position. In a newborn child, the angle of inclination of the tympanic membrane in the horizontal position is 10-20 degrees, in adults it is 40-50 degrees. A newborn baby's eardrum is thicker than an adult's eardrum. Its thickness depends on the characteristics of the middle ear mucosa. The diameter of the tympanic membrane is around 9 mm in both young children and adults. A healthy drum curtain can have a shiny gray color, sometimes with a red or yellow tint.

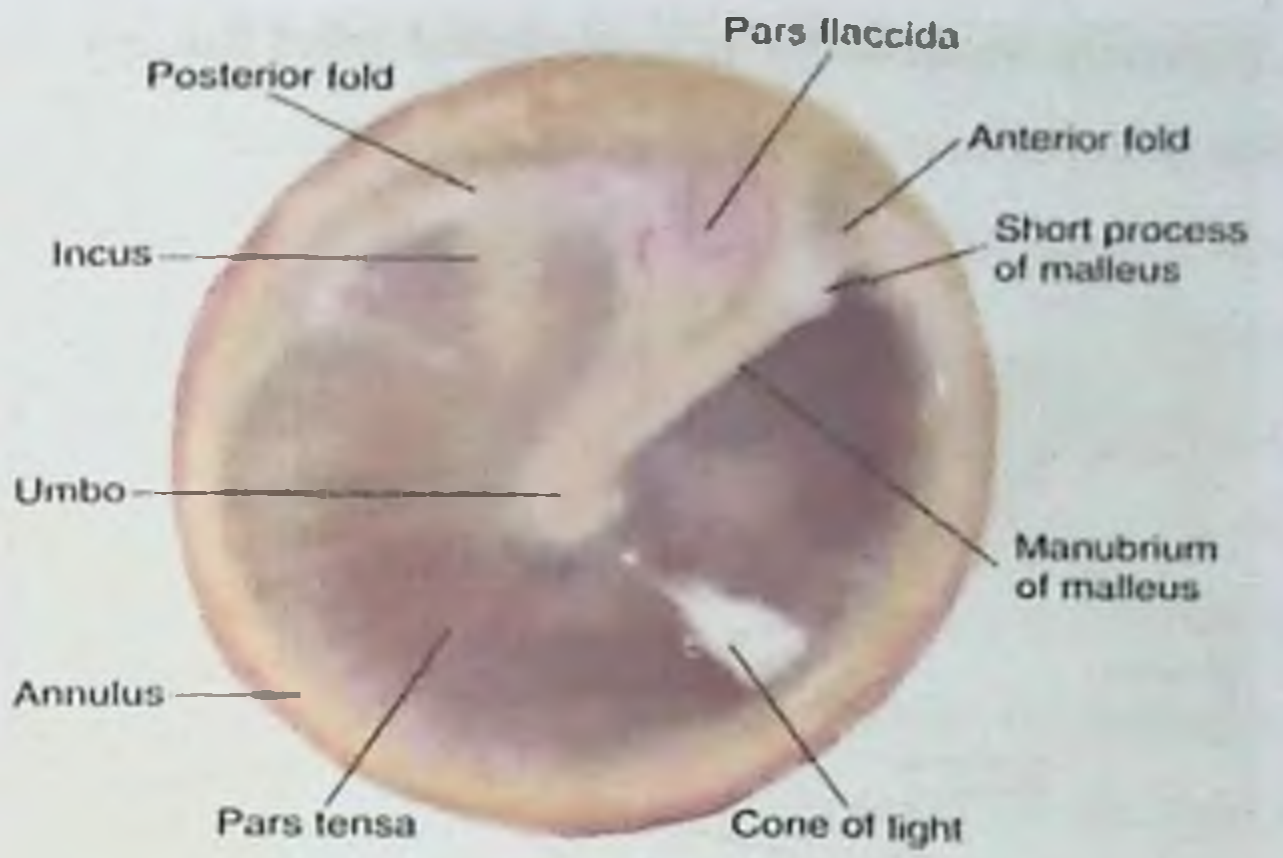
The tympanic membrane is a thin, semi-transparent membrane and consists of two parts - the larger, tense, mesotympanal (Pars tenza) and the smaller, cool, epitympanal (Pars Flassida, Shrapnelli) parts. The tense part consists of three layers: outer epidermal (continuation of the skin of the external auditory canal), internal mucus (mucous membrane of the middle ear), middle fibrosis (fibrous, closely connected with each other, consisting of many fibers in radial and circular direction) forms the layer.These layers are well supplied with blood vessels and sensory nerve fibers, which greatly increase the sensitivity of the layer to pain.

When inspecting a healthy drum head with a special tool, the hammer handle is clearly visible from the top down and back, dividing the top of the drum head into two equal parts. The part of the drum head that is above the hammer is thin and not very tight, this part of the drum head is called the cool part.

The cold part consists of only two layers - it does not have a fibrous layer. Tympanic membrane in an adultof the external auditory canalIt is located at an angle of 45° to the lower wall, and in children this angle is more acute and equal to about 20°. This forces the eardrum to pull down and back when examining the

eardrum in children. The drum curtain has a round shape, its diameter is about 0.9 cm. The veil is usually grayish-pink in color, and the drum is slightly pulled back towards the cavity, and therefore in its center there is a cavity called the "navel" (Umbo). is determined. Not all parts of the eardrum lie in the same plane relative to the axis of the external auditory canal. The front - lower parts of the curtain are located most perpendicularly, so light rays directed to the external auditory canal, reflected from this place, give a light cone, which in the normal position of the drum curtain, always occupies one position. This cone of light has identification and diagnostic value.

Drum curtain - from front to back and from top to bottom, it is necessary to distinguish the handle of the hammer. The angle formed by the hammer handle and the beam cone is open from the front. In this picture, the right membrane can be separated from the left. In the upper part of the handle of the hammer, a small protrusion is visible - a short process of the hammer, from which the folds of the hammer (front and back) extend back and forth, loosely separating the elongated part of the membrane. For convenience, when determining certain changes in different parts of the membrane, it is customary to divide it into four quadrants, that is, the front-upper, front-lower, back-upper and back-lower quadrants (Pic. 3). These squares are conditionally separated by a line passing through the handle of the hammer and a line perpendicular to the first membrane passing through the navel.



TYMPANIC MEMBRANE

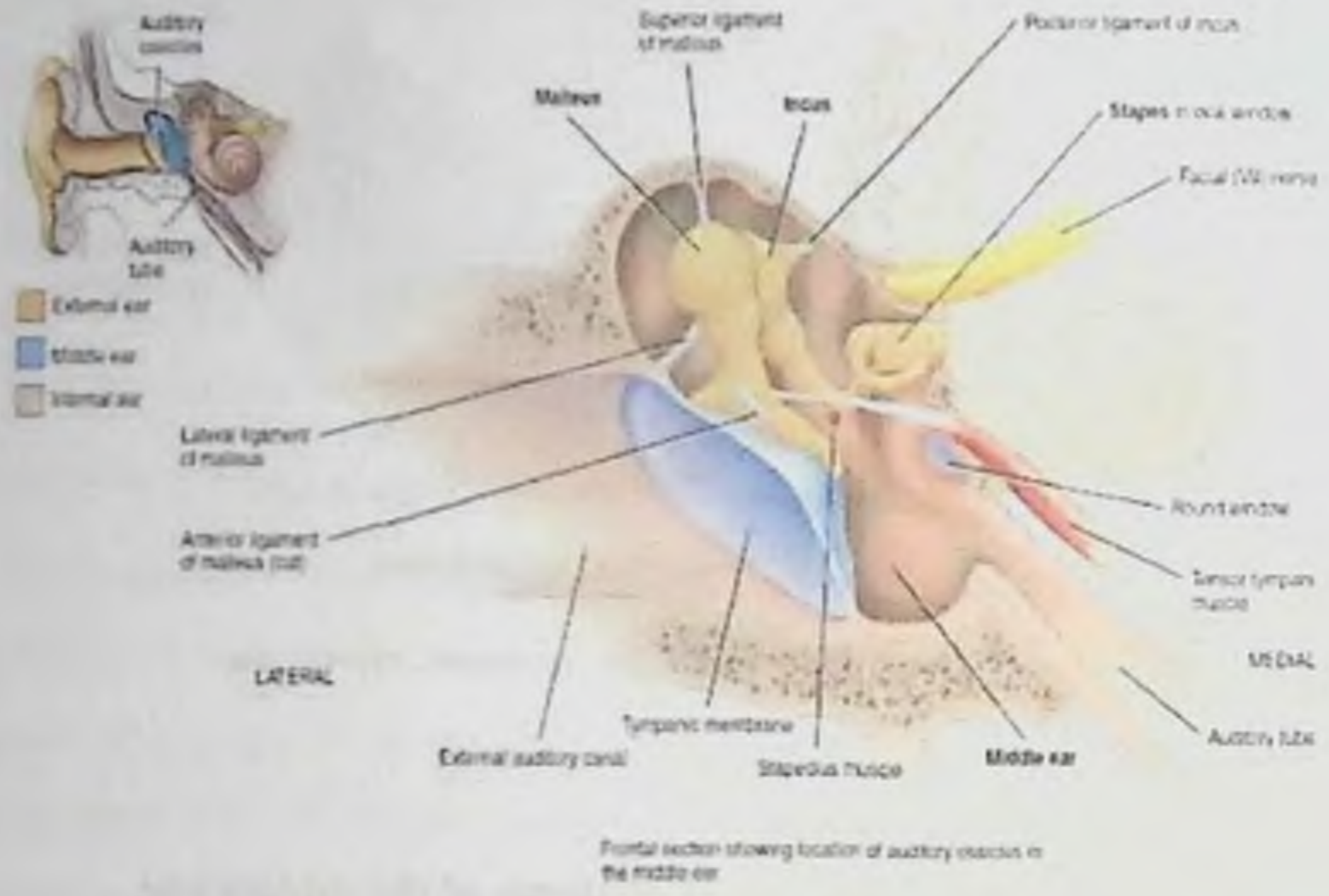
Picure: 3.Right tympanic membrane:

1.2. Clinical anatomy of the middle ear

Middle ear-(auris media),it consists of three communicating air spaces: the auditory tube, the tympanic cavity, and the air space system of the mastoid septum. All these cavities are covered with a single mucous membrane, and corresponding changes occur with inflammation in all parts of the middle ear.

Drum space (cavum tympani) is the central part of the middle ear and has a very complex structure. Although it is small in size (about 1cm3), it is functionally important. The cavity has six walls: the outer (lateral) part is almost completely covered with the inner surface of the tympanic membrane, and only its upper part is bone (outer wall of the tent). The anterior wall, bordered by the canal of the internal carotid artery, has an opening leading to the auditory tube and a canal in which the muscle that stretches the eardrum is located. The lower wall (yoke) is limited by the bulb of the jugular vein, sometimes it protrudes significantly into the tympanic cavity. The back wall (mammary) in the upper part has an opening leading to a short channel connecting the drum cavity with the largest and most permanent cell of the mammary tumor - the cave (antrum). The medial (labyrinth)

wall is mainly occupied by an oval-shaped relief that corresponds to the conch cochlea (Pic. 4).



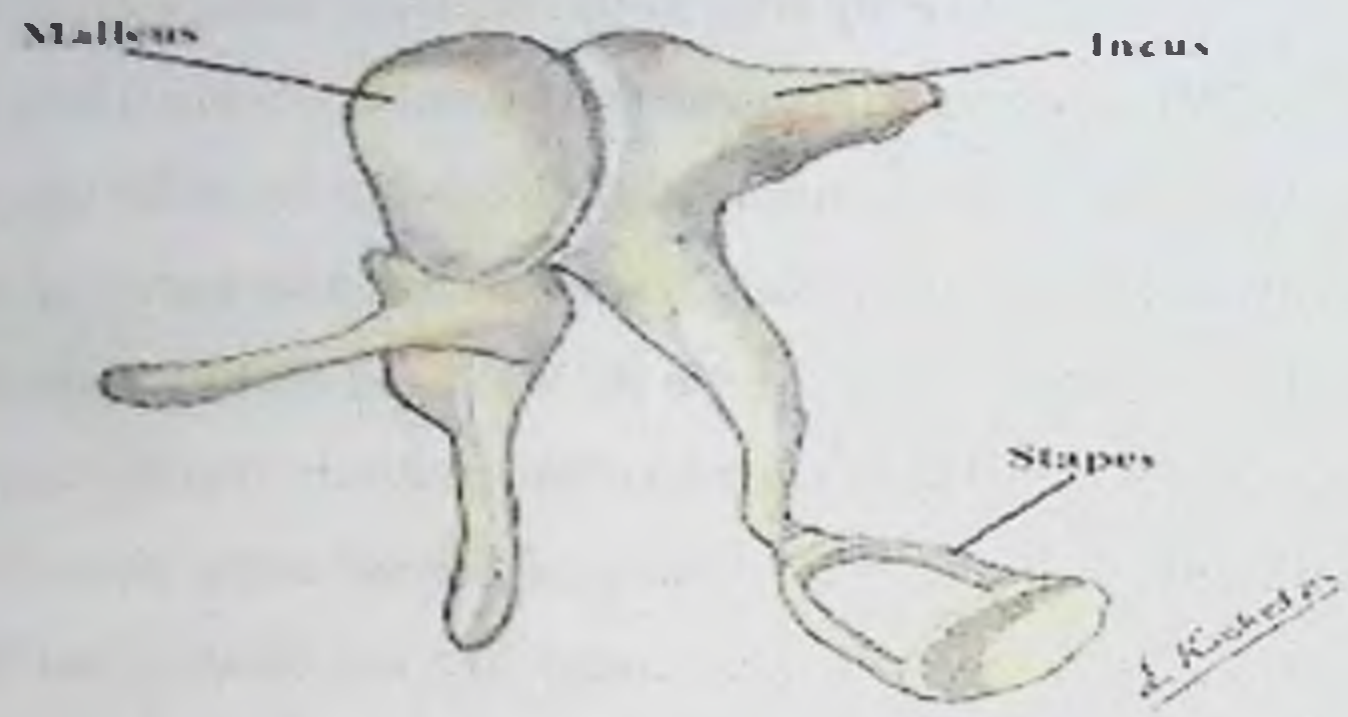
Picture. 4.Drum cavity:

Behind and above this fold is a vestibule window, and behind and below it is a cochlea window. The channel of the facial nerve (n. facialis) passes through the upper edge of the medial wall. Towards the back, it is limited to the upper edge of the window space of the hall and then turns down and the drum is located in the thickness of the back wall of the space.The duct ends in a teat-shaped orifice. The upper wall (the roof of the drum cavity) is limited by the middle cranial fossa. The drum cavity is traditionally divided into three parts - upper, middle and lower. The upper part is epitympana l*(epitympanum)* is located above the upper edge of the elongated part of the tympanic membrane. The middle part of the tympanic cavity is mesotympanal *(mesotympanum)*, and the largest in terms of size corresponds to the location of the tense part of the tympanic membrane. The lower part is hypotympanal *(hypotympanum)* is a cavity located at the lower junction of the drum curtain.

In the drum cavity (Pic. 5) threeauditory bones include malleus, incus and stapes. beingforms a short circuit that transmits vibrations from outside the middle ear to the inside. The hammer head and sandbox lie on the upper floor of the drum cavity. The handle of the hammer rests firmly on the upper half of the drum curtain, the head of which is attached to the walls and roof by three small strings. Other ligaments keep the large opening of the peduncle slightly deeper in the back wall of the cavity. The long stem of the sandon bends at the lower three sides and forms a free joint with the head of the tendon. The last, smallest and lightest cochlear is 3 mm long and weighs 3 mg. It lies almost horizontally on the right side of the sandan. Its platform (plate) is well adapted to the oval window and is held in place by means of a circular thread.

When the stapedius muscle contracts, it "pulls" the stapes from the hall window, and the muscle that pulls the eardrum, on the contrary, pushes the stapes to the window. Thanks to these muscles, a highly sensitive dynamic balance of the entire system of auditory bones is created, which is extremely important for the auditory function of the ear.

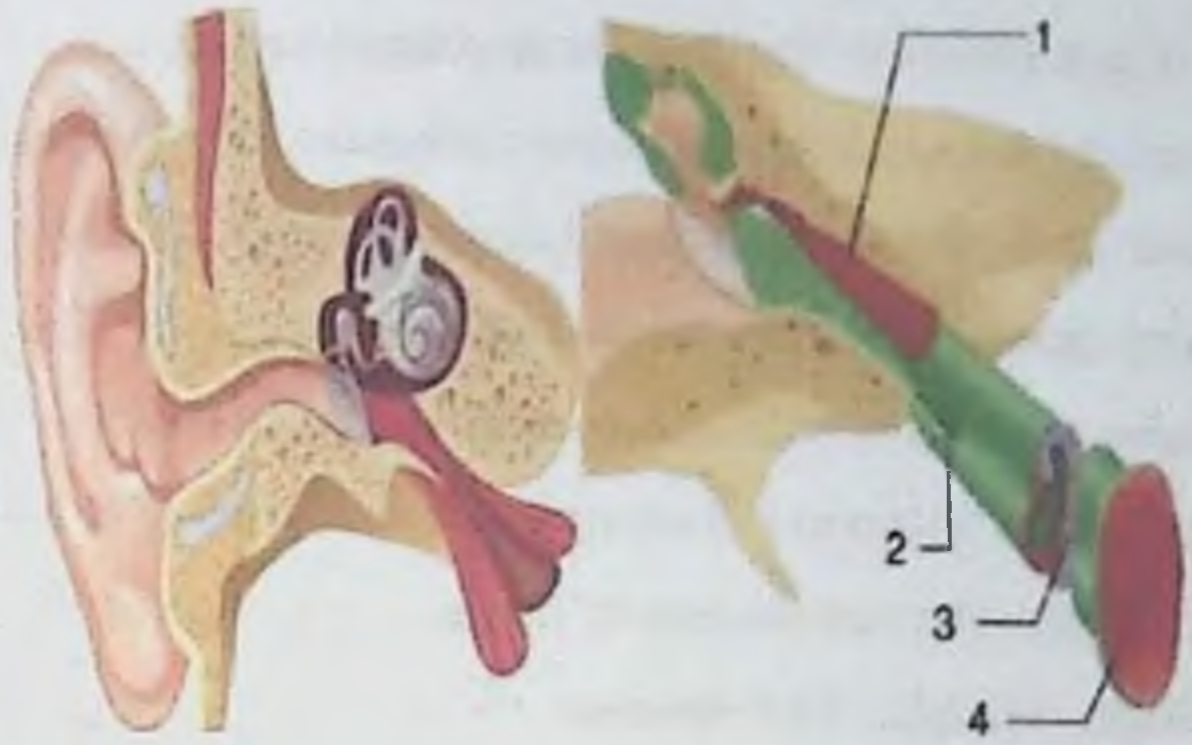
It can be seen that there are two very small muscles in the middle ear. One of them, the muscle tensioning the tympanic membrane (m. tensor tympani), leaves the bony channel a little higher than the opening of the Eustachian tube and, changing its downward direction, passes through the gate-like device to the upper part of the hammer handle. Its main function is to pull the hammer inward and, as a result of this pull, increase the tension of the drum curtain. The second one is called stapedius muscle. It starts from the back wall of the tympanic cavity and stretches forward with its thin fibers to join the length. Its main function is to pull the sandbox from the oval window due to the backward deviation of the extension.



Picture. 5. *Auditory ossicles (Malleus, Incus, Stapes)*

Hearing aid (tuba auditory s. Eustachii) is 45 mm long and goes down and inward from the tympanic cavity to the nasopharynx. The upper part of the auditory tube narrows sharply, from where it is surrounded by bone. As it approaches the nasolabial fold, it expands and turns into an arch. Its mucous membrane is a continuation of the mucous membrane of the middle ear. The cilia (tiny hair-like structures) surrounding it help to quickly release mucus from the middle ear to the nasopharynx.

In an adult, the auditory tube is 3.5 cm long and consists of two parts: the bone and the ear. In children under 2 years old, the auditory tube is shorter and wider than in adults (Pic. 6). The laryngeal opening of the auditory tube opens on the side wall of the nasal part of the throat at the level of the rear ends of the concha. The cavity of the tube is covered with a mucous layer of floating epithelium. Its cilia move towards the nasal part of the larynx, thereby preventing infection of the middle ear cavity with the microflora that is constantly present there. In addition, the ciliated epithelium also ensures drainage of the drum cavity.



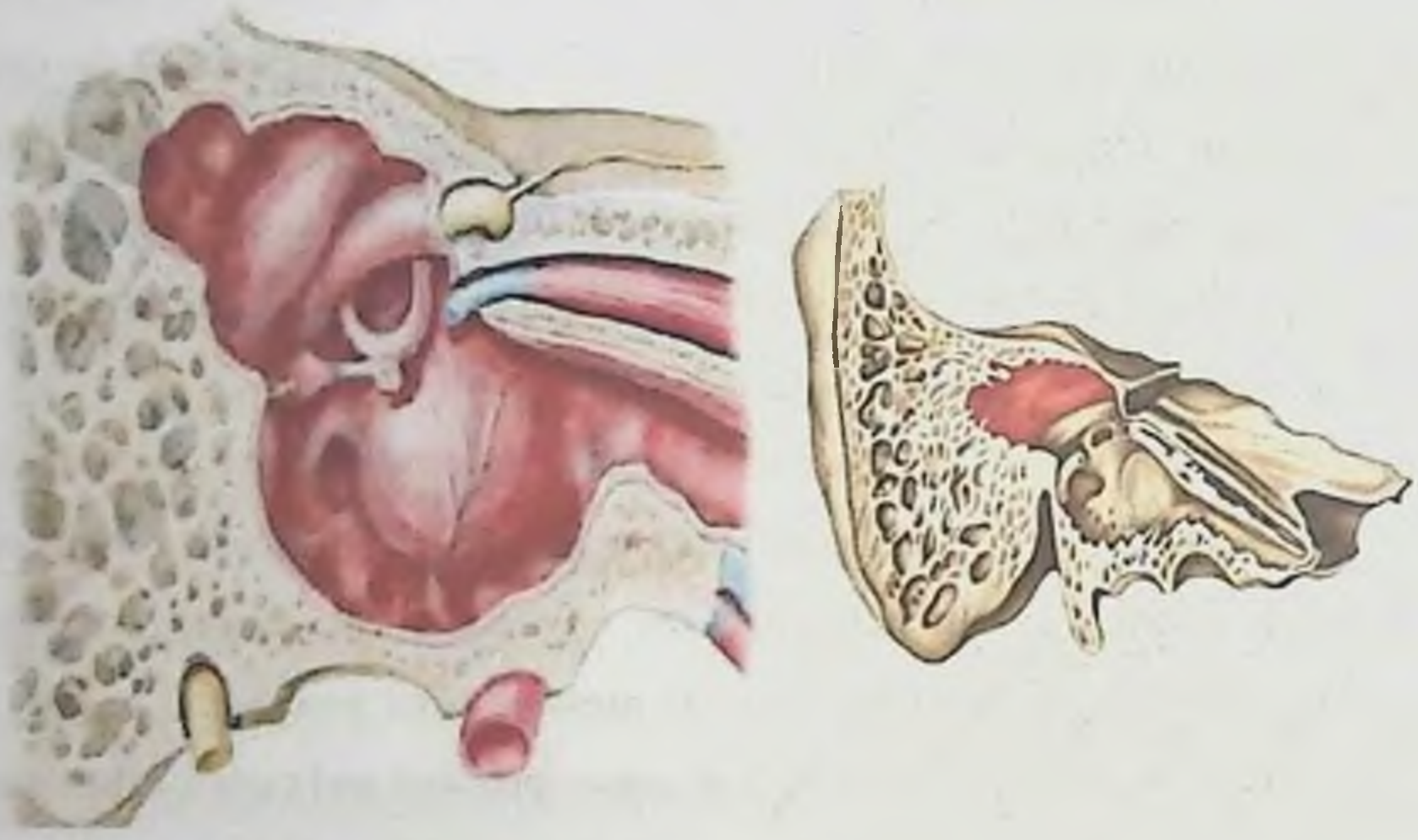
Picture. 6. Auditory tube: 1 - bony part of the auditory tube; 2, 3 – part of the uncle; 4 - faryngeal opening of the auditory tube

The main task of the Eustachian tube is to ensure air exchange in the middle ear and maintain the same atmospheric pressure on both sides of the eardrum.The cavity of the tubenormally closed,opens with swallowing movements and air enters the middle ear. In this case, the pressure is equalized between the external environment and the cavities of the middle ear, which is very important for the normal functioning of the ear canals.

When skydiving or when an airplane descends rapidly, the tube can become firmly closed. As a result, pain in the ear, an unpleasant sensation in the ear appears. Such a situation can pass with the opening of the Eustachian tube without increasing the external atmospheric pressure. The mouth and nostrils should be well closed. This method, which increases pressure and calls for the opening of the tube, was used by the Italian anatomist Antonio Maria Valsalva (1660-1723), who recommended this method to clear the middle ear of pus.

A teat-like obstruction (mastoid process). The back part of the middle ear is represented by the teat-shaped septum, in which the sound enters the tympanic cavity through the teat-like cavity and the cavity in the upper back part of the tympanic cavity. There are many air cells (Pic. 7). Therefore, there are different types of structure of the mastoid septum, and it has a pneumatic, sclerotic, diploetic and mixed structure.

Cave *(antrum)*- the drum is the largest cell in direct contact with the cavity (through Aditus ad antrum). The cave is bordered by the posterior cranial fossa and sigmoid sinus, the middle cranial fossa, through its posterior wall, the external auditory canal, where the facial nerve canal passes. Therefore, the destructive processes of the cave walls cause severe complications from the border areas. In an adult, the cave lies up to 1 cm deep, in the first years of childhood - near the surface of the nipple. The surface area of the temporal bone of the cave is located within the Shipo triangle. The mucous membrane of the middle ear serves as a mucoperiosteum, it almost does not contain glands, but they can appear in inflammatory processes due to metaplasia.

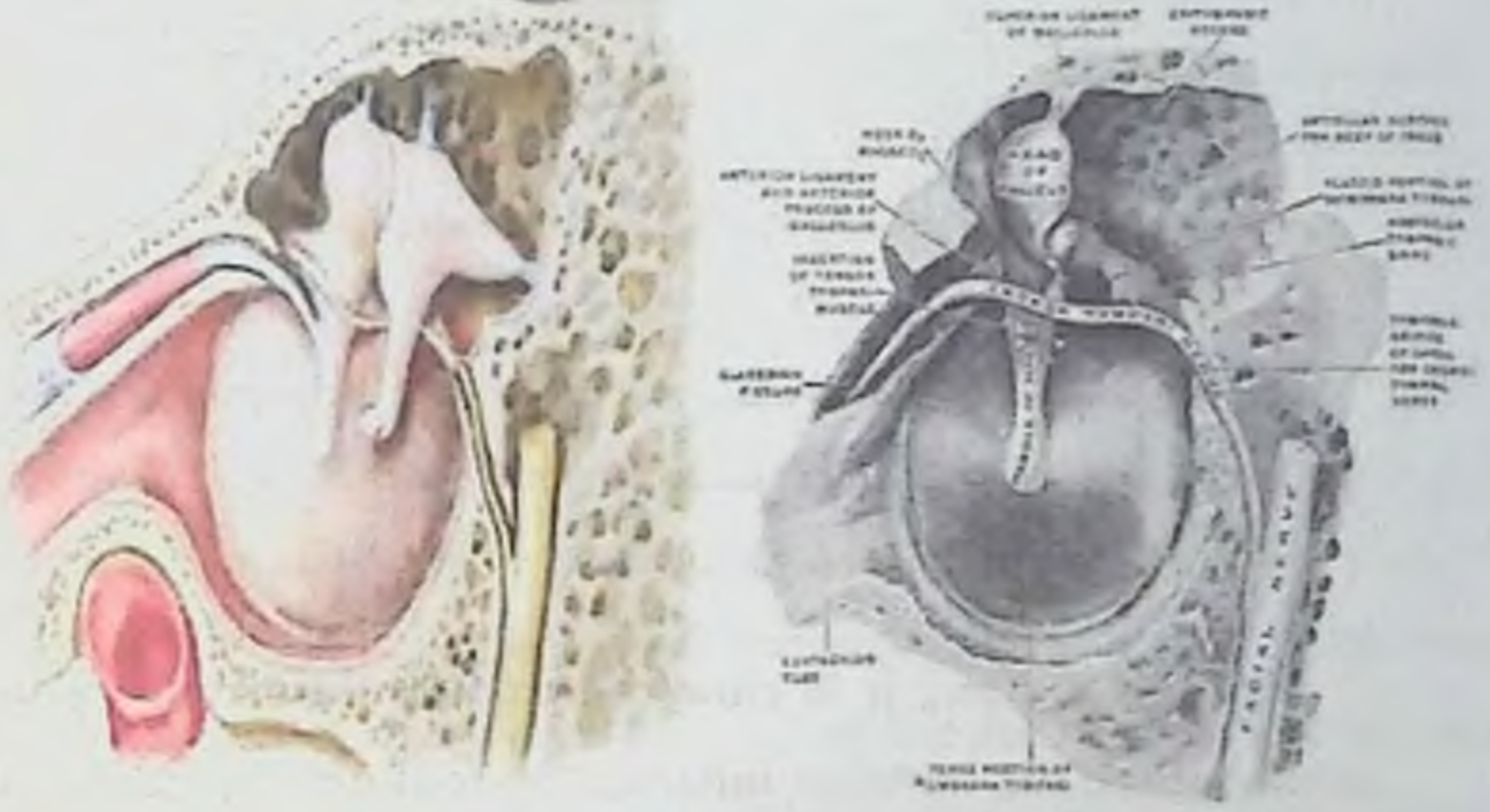


Picure 7.*The ventilating part of the teat*

The innervation of the mucous membrane of the middle ear is very complex. Here, in a small area, many nerves are concentrated. From the tympanic nerve fibers emerging from the larynx in the wall of the labyrinth (hence the symptoms of otalgia in glossitis and vice versa), as well asinternal sleep disorderthere is a nerve plexus consisting of sympathetic nerve fibers coming from The tympanic nerve leaves the tympanic cavity through the upper wall in the form of a small wall

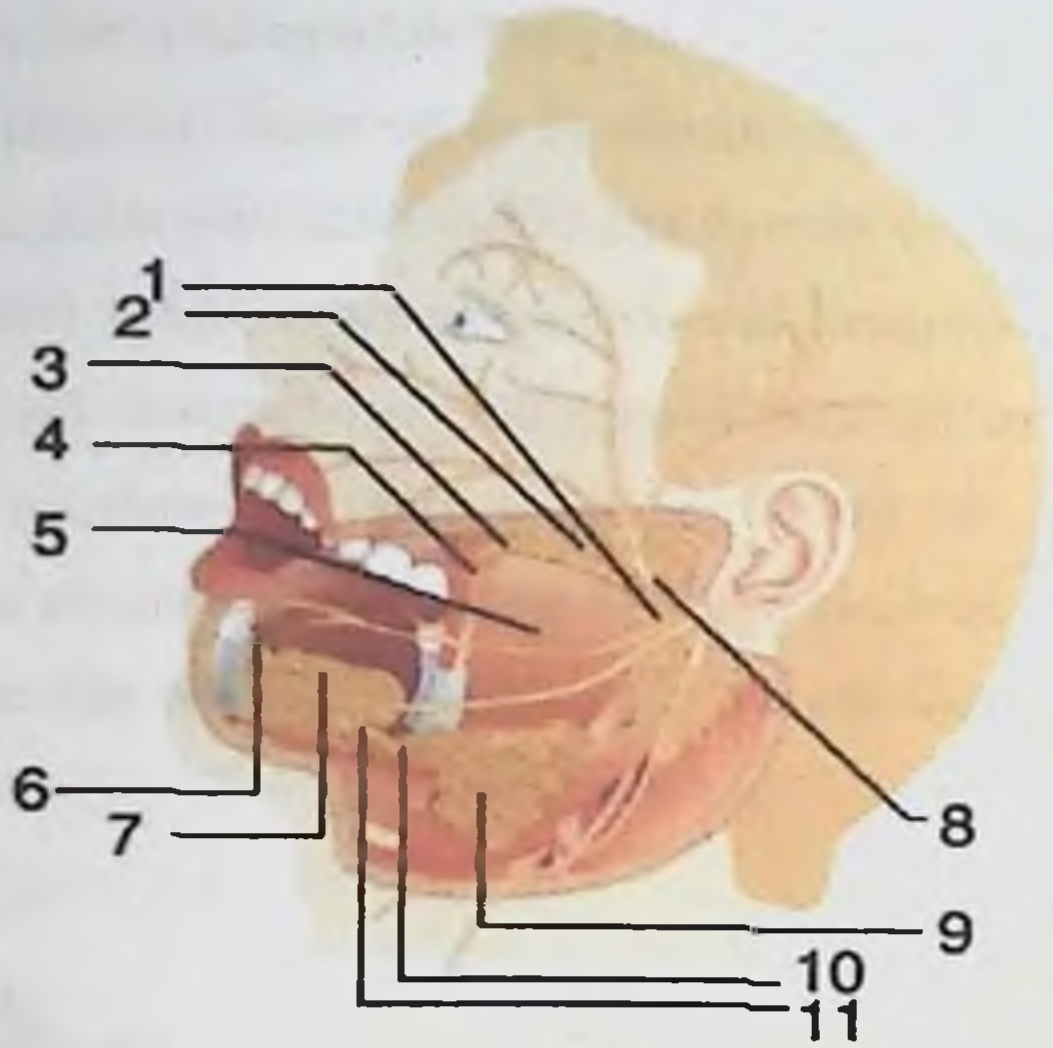
stone, approaches the parotid gland and supplies it with parasympathetic fibers. In addition, the mucous membrane of the middle ear receives innervation from the trigeminal nerve fibers, which causes acute otitis media acute pain reaction.

The tympanic line (chorda tympani) departs from the facial nerve in the tympanic cavity, exits through the stony-tympanic fissure, and joins the lingual nerve (Pic. 8). Due to the drum strings, the sensation of salty, bitter and sour appears in the front 2/3 of the tongue. In addition, the string drum fiber supplies parasympathetic fibers to the salivary glands (jaw and sublingual).



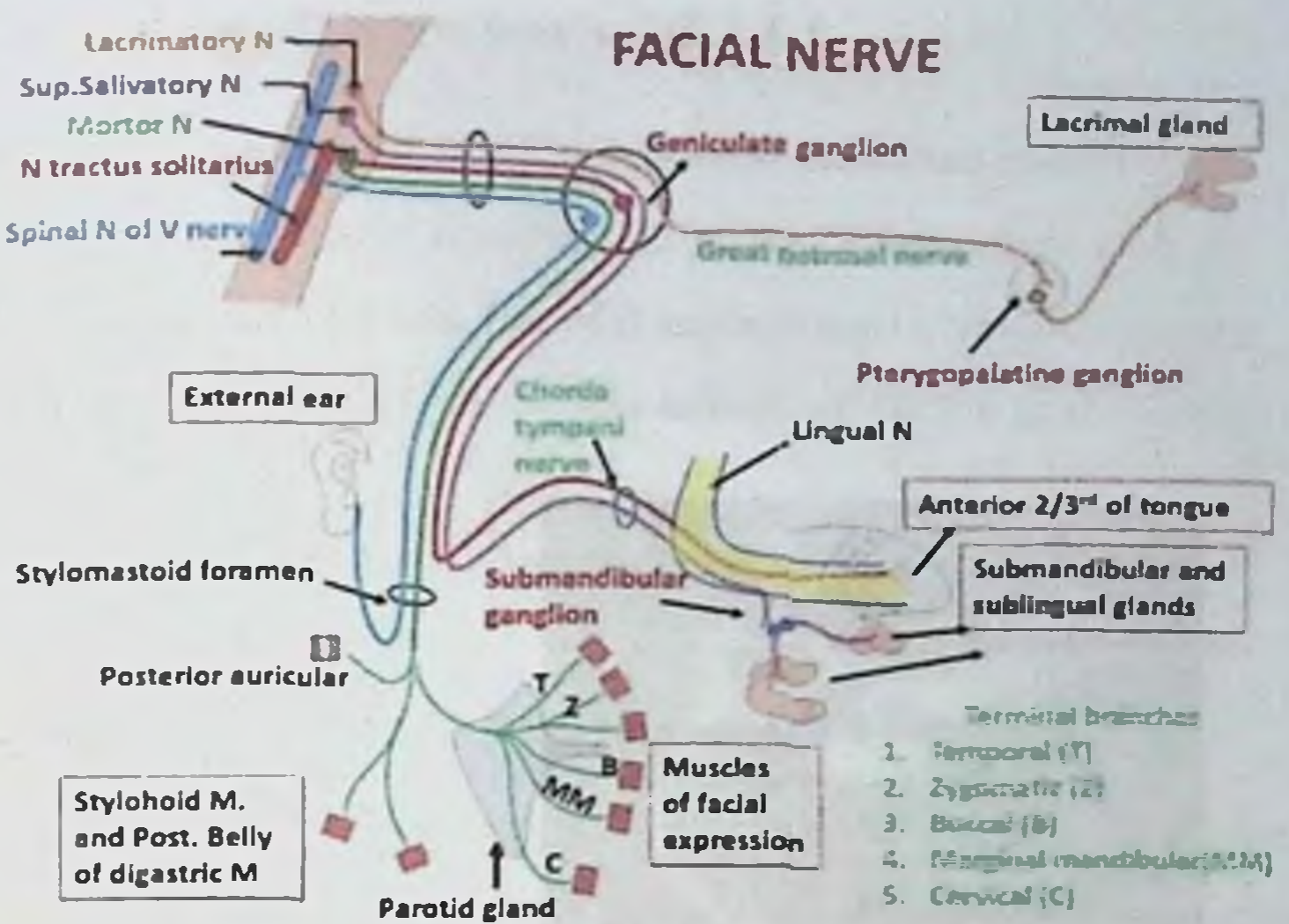
Picture.8.Facial nerve and tympanic membrane

Facial nerve– (n. facialis) is located in the Fallophiev canal. From the facial nerves to the stapedius muscle, and at the beginning of the horizontal knee, from the knee joint to the upper surface of the bony pyramid, a small branch - the big stony nerve - comes out and it supplies the lacrimal gland with parasympathetic fibers. The facial nerve itself, exiting through the bigis-mammary foramen, forms a network of fibers - a "big goose paw" (Pic. 9).



Picture. 9. *Topography of facial nerve branches: 1 – salivary gland; 2 – the lower branch of the facial nerve; 3 – pre-auricular salivary gland; 4 – cheek muscle; 5 – chewing muscle; 6 – excretory channel of the thylo-salivary gland; 7 – thylo-salivary gland; 8 – upper branch of the facial nerve; 9 – maxillary salivary gland; 10 – lower branch of the facial nerve; 11 – thylo-salivary gland*

The facial nerve is in close contact with the capsule of the pre-auricular salivary gland, and therefore inflammatory and tumor processes can lead to the development of paresis or paralysis of this nerve. Knowing the topography of the facial nerves coming out of it at different levels of the branches makes it possible to assess the affected area of the facial nerve (Pic. 10).



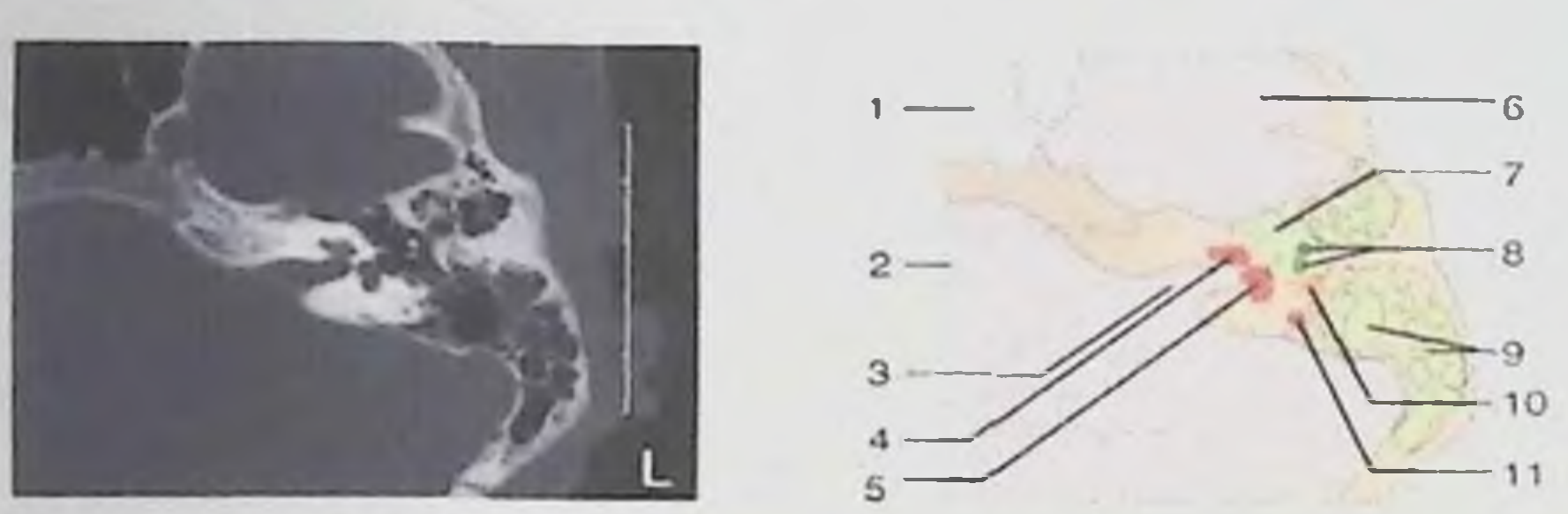
Picture. 10.*Anatomy of the facial nerve*

Thus, the complex innervation of the middle ear is closely related to the innervation of the teeth-jaw system. Therefore, there are a number of pain syndromes, including ear pathology and diseases of the jaw system. Blood supply to the middle ear is carried out by branches of the external and internal carotid arteries. The nipple-mammary artery to the basin of the external carotid artery (a. stylomastoidea)- a branch of the posterior ear artery (a. auricularis posterior),anterior tympanic artery (a. tympanic anterior)- maxillary artery(a. maxillaris). Branches extend from the internal carotid artery to the anterior parts of the tympanic cavity.

Innervation of the drum cavity. This is mainly the tympanic nerve *(n. tympanicus)*- a piece of the tongue-laryngeal nerve (n. glossopharyngeus),due to anastomosis with facial, trigeminal nerve and sympathetic internal carotid plexus.

1.3. Clinical anatomy of the inner ear

Inner ear (auris interna), that is, the labyrinth is very complex. The inner ear is thick in the stony part of the temporal bone and consists of a bony labyrinth, which contains a membranous labyrinth and is connected to the drum cavity on the lateral side, and on the medial side - to the back fossa of the skull. (Pic.11).



Picure:.11. *Location of the bony labyrinth in the bony pyramid: 1 – poniform cavity; 2 - brain tissues; 3 - internal auditory canal; 4 - Cochlea; 5 - labyrinth threshold; 6 - brain tissue; 7 – attic; 8 - auditory bones; 9 – air cells of a mammary tumor; 10 - facial nerve; 11 - semicircular channel*

There is a perilymphatic space between the bone and the membranous labyrinth. It is filled with fluid - perilymph, its chemical composition has many similarities with cerebrospinal fluid (CSF). The membranous labyrinth is filled with fluid - endolymph and is attached to the walls of the bony labyrinth by connective tissue tension. Perilymph and endolymph differ from each other in electrolyte composition. (Pic. 12).

Picture: 12.*Labyrinth, Veillabyrinth. Corridor and Sink aqueduct*

The perilymphatic space through the subarachnoid narrow bone canal - cochlear water flow *(aqueduct cochlea),* connects and perilymphatic channel *(perilymphatic duct)* passes through. The membranous labyrinth is a closed system of channels that leads through the endolymphatic duct to the endolymphatic sac *(endolymphatic sac)* connected. The second is located on the back of the pyramid, in the thickness of the dura mater, behind the opening of the internal auditory canal.

The bony labyrinth is a complex cavity, the walls of which consist of dense bone (Pic. 13). It is divided into three sections: a hall *(vestibulum),* three semicircular canals (canalis semicircularis) and cochlea *(cochlea),* this passes into the internal auditory canal (meatus acusticus internus). The corridor is the central part of the labyrinth. Phylogenetically, this is the oldest part of the labyrinth. At the back, the atrium communicates with the circular canals, and at the front with the concha. The outer wall of the corridor is mainly occupied by the vestibule window. The inner wall corresponds to the bottom of the inner ear canal.

Picture. 13.Bone Labyrinth

Inside the corridor there are two pockets: a spherical recess *(recessionsphericus)* and ellipsoidal indentation*(recessus ellipticus)*. In the first, closer to the cochlea, a spherical bag *(sacculus)*, in the second, adjacent to the semicircular canals, an elliptical sac *(utriculus)*is located. The front part of the corridor is connected with the cochlea through the corridor stairs, and the back part is connected with semicircular canals (Pic. 14).

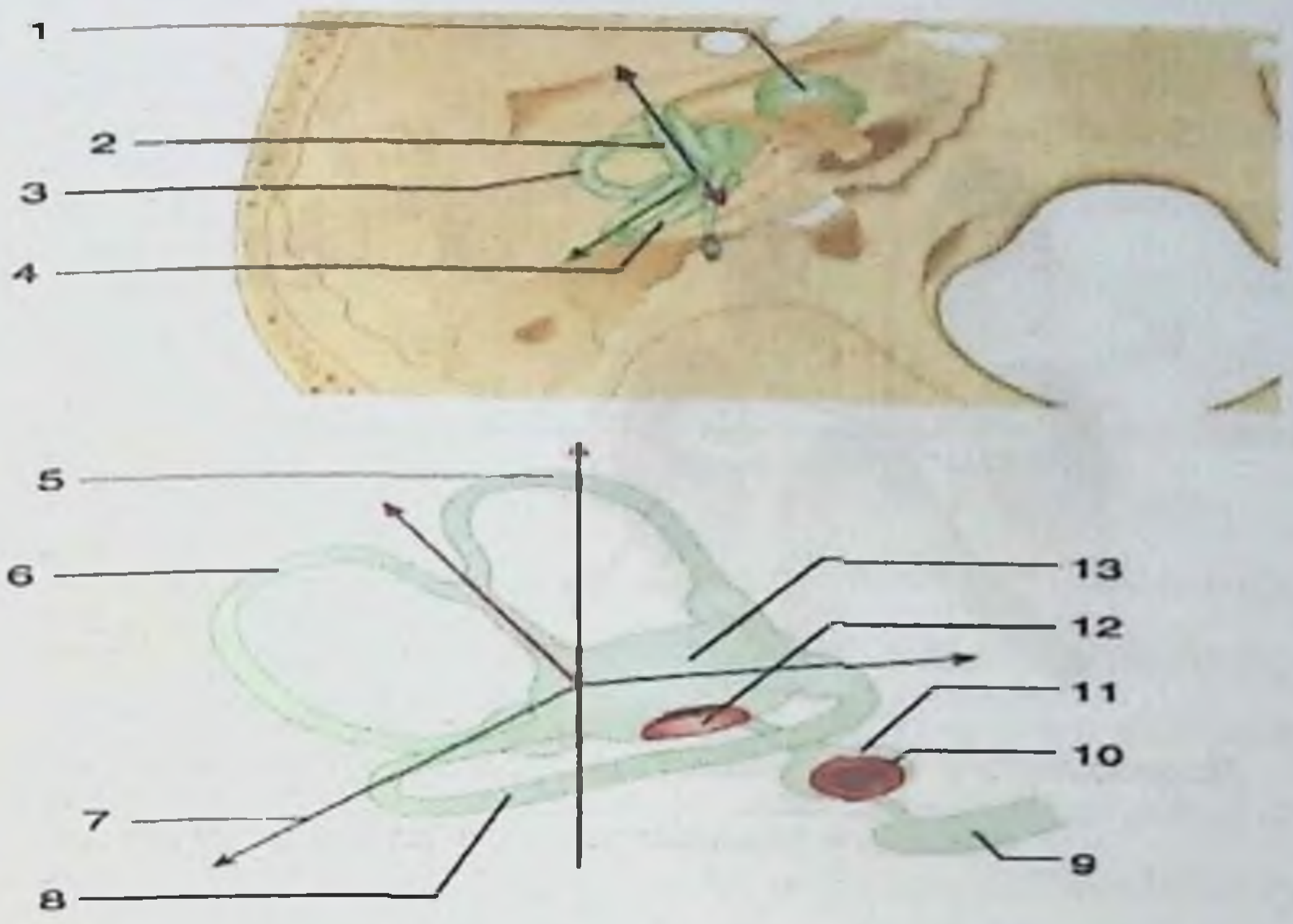
Semicircular canals. Three semicircular canals are located in three mutually perpendicular planes:

lateral (horizontal) at an angle of 30 ° to the horizontal plane;

front (vertical) - in the vertical plane;

located in the back (sagittal) sagittal plane.

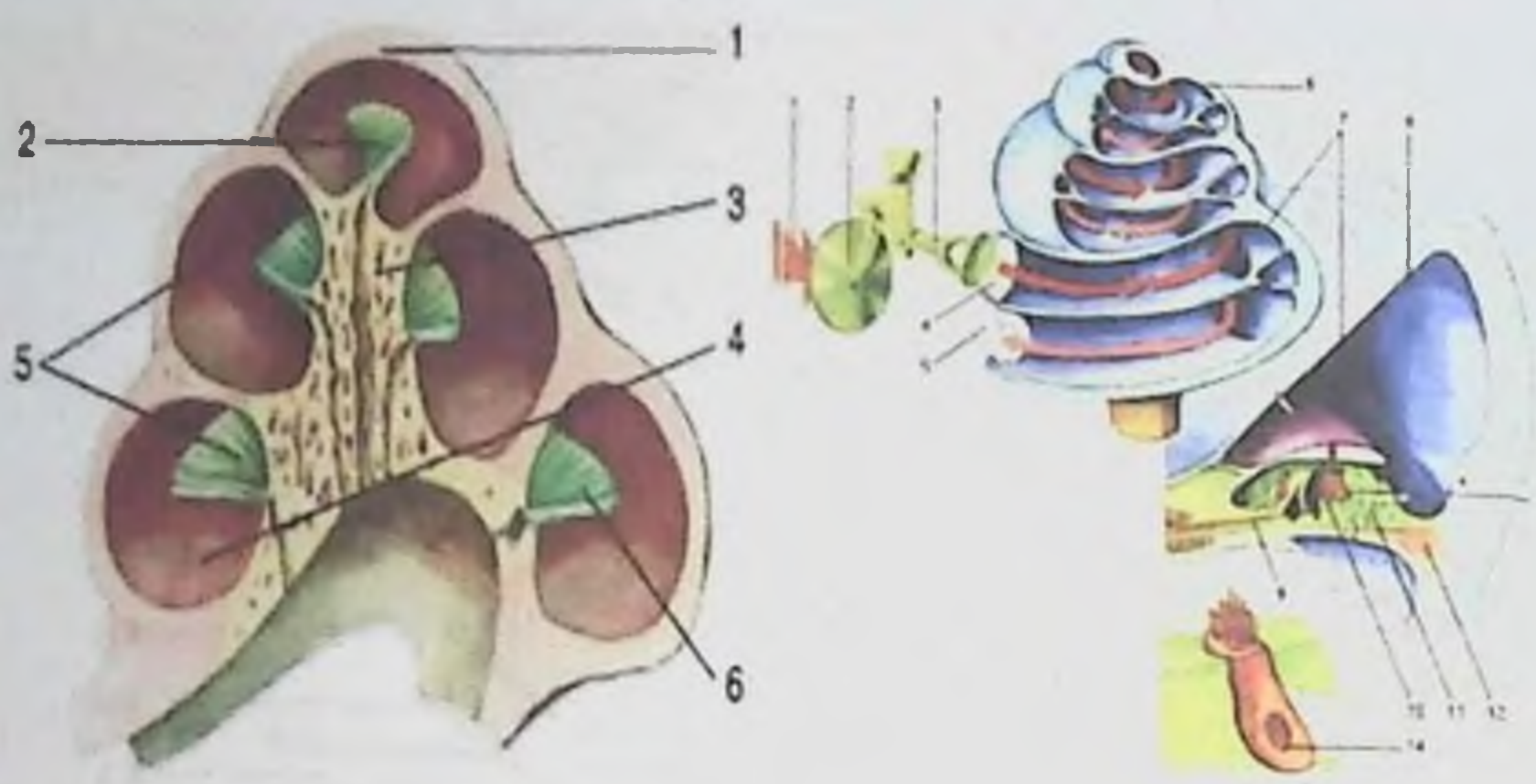
Each channel has an enlarged part (ampulla) and a smooth knee depending on the elliptical deepening of the hall. The smooth knees of the vertical and sagittal channels - front and back - are united in one common knee. Five openings of semicircular canals open in the corridor.



Pic. 14.Inner ear: 1 - cochlea; 2, 5 - frontal semictrcular canal; 3, 6 – sagittal semicircular canal; 4, 8 – horizontal semicircular canal; 7 – cavity surfaces; 9 - Cochlea; 10, 11 – spherical bag; 12, 13 – elliptical bag.

Cochlea.Consisting of this compact bone, the bone is a spiral tube that rotates 2.5 times around its axis. (Pic. 15).

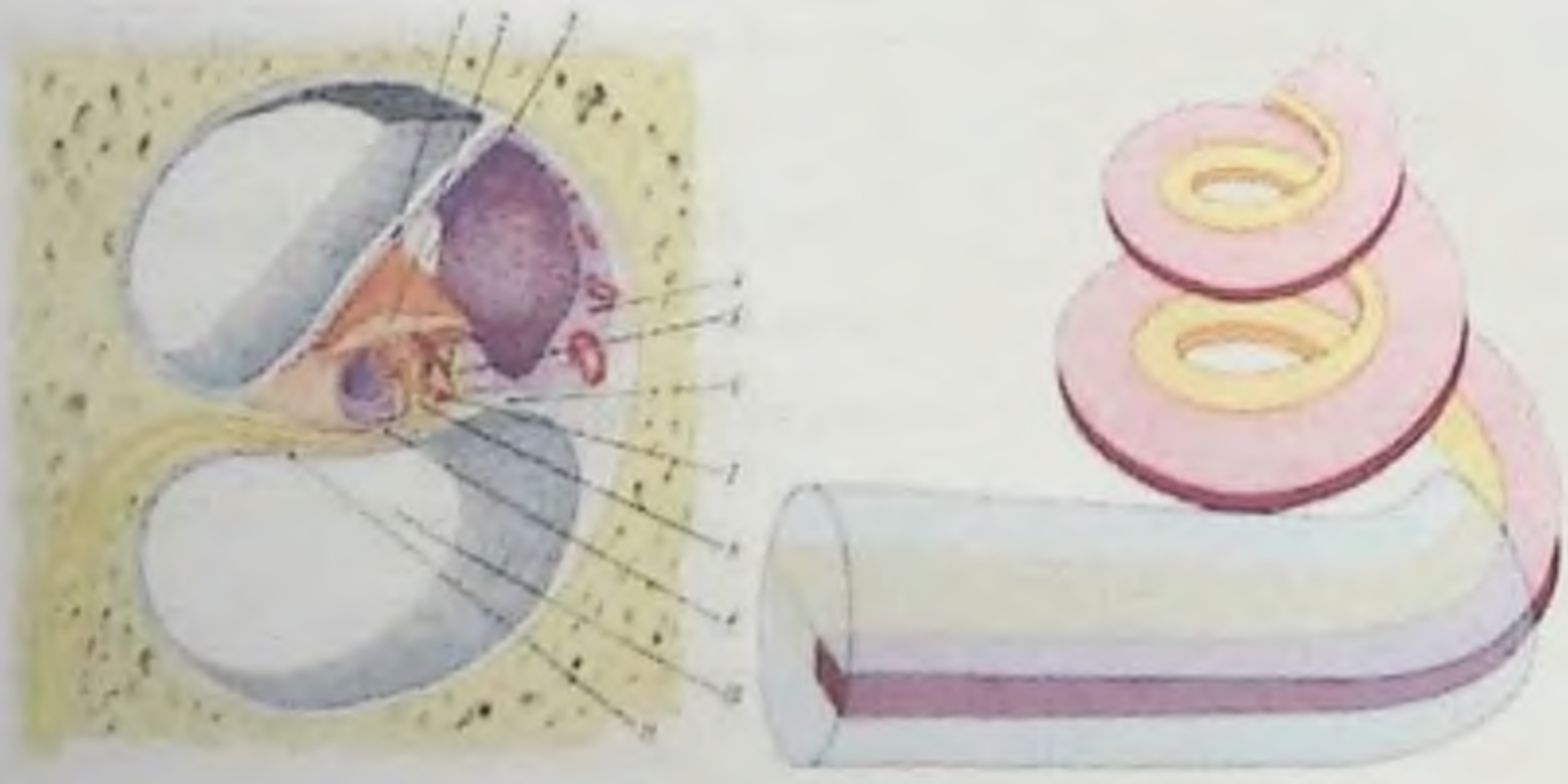
The main gajak drum comes out at the end of the cavity and is called the promontorium. Conch cochlea bone axis*(modiolus)*surrounds a wide base, from which the bony spiral plate*(lamina spiralis ossea)*goes out and it also makes two and a half turns.



Picure 15.*Anatomy of the cochlea: 1 - the upper fold of the cochlea; 2 - helicotrema; 3 - axis; 4 – cochlea ladder; 5 - drum ladders; 6 - spiral plate.*

From the free edge of this bone plate, two membranous membranes emerge: - basilar*(membrana basilaris)*and under the corner - vestibular*(membrana vestibularis)*,they are an independent channel in the cochlea - the cochlea channel*(cochlear duct)*creates.

Thus, each layer of the cochlea is divided into two layers: The upper part is the hall ladder, which starts from the front wall of the inner ear.(scala vestibuli) andand the lower part is a drum ladder(scalatympani), it starts from the apex of the cochlea and then goes to the stair of the hall.(Pic. 16).

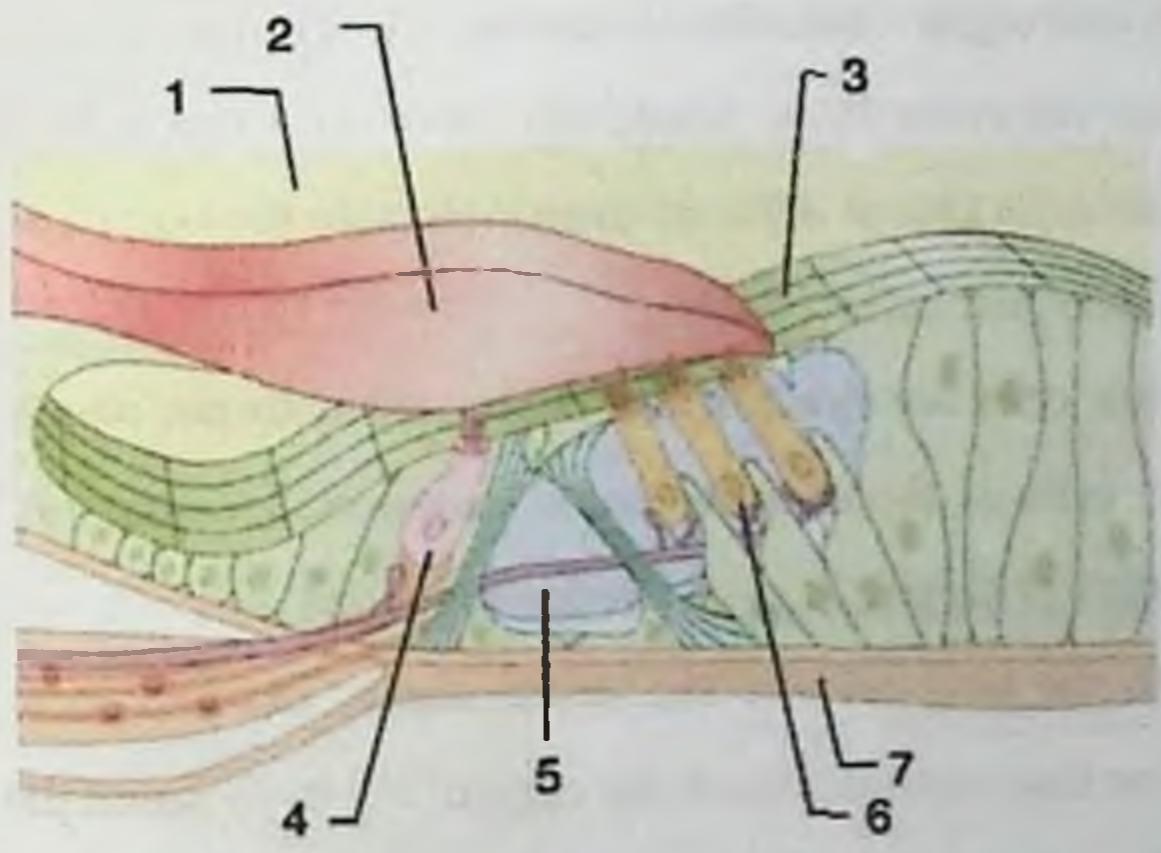


Picture: 16.*Cochlea ladders (scheme)*

Both ladders are connected by a small hole called a helicotrema located at the top of the cochlea. The corridor ladder is covered with a curtainbegins with an oval window,drum staircase ends with a circular window secured by a secondary drum curtain. In the center of the testicle is the body of the auditory nerve and the spiral ganglion of the cochlea*(ganglion spiral cochlea)*there is a channel located. Nerve fibers spread to it from the spiral (Corti) organ. (The Italian histologist Merchello Alfonso Corti wrote the first in 1851 and is named after him).

A curtained cochlea or cochlea channel*(cochlear duct)*- this is a spirally twisted channel with a triangular cross-section. The Cochlea begins in the corridor near the canalicular bag, connects with the canal connecting with it, and ends in the dome of the cochlea. The Cochlea stream is located in the outer half of the Cochlea channel, bounded from above by the staircase of the hall, and from below by the drum staircase (Pic. 17).

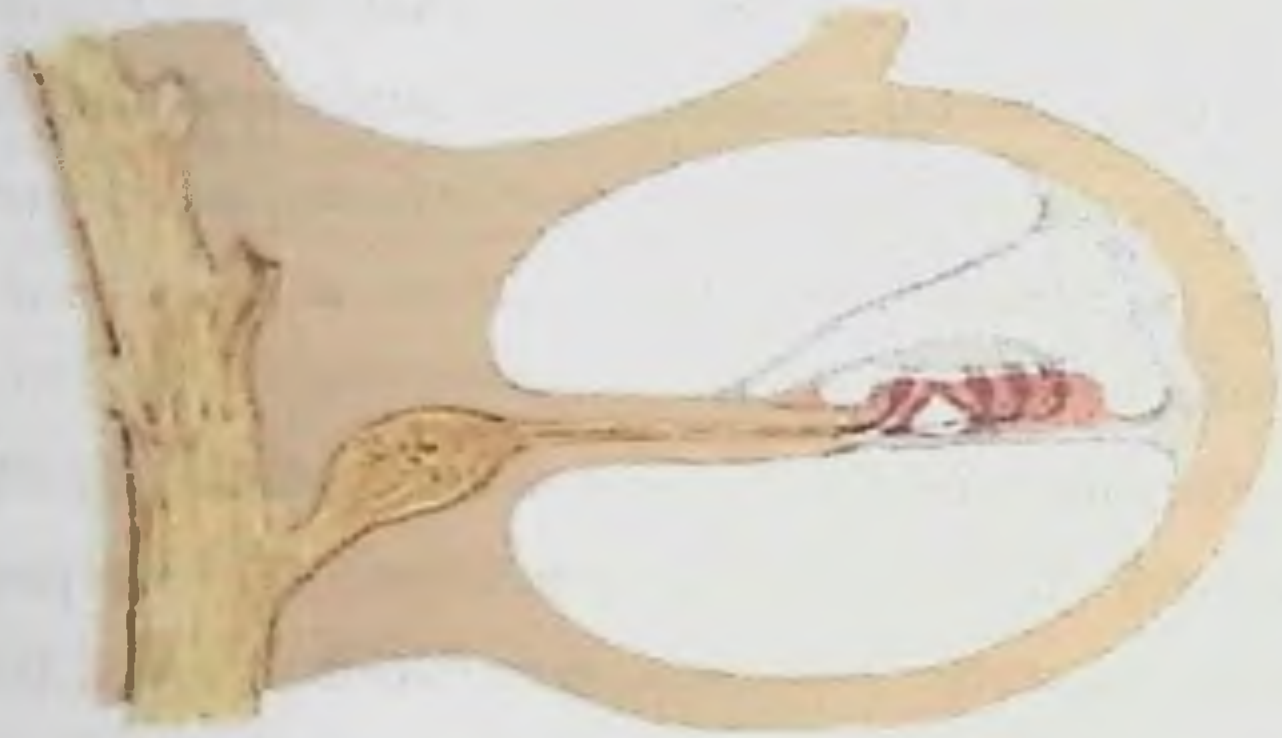
The upper wall of the transition to the cochlea is formed by a thin connective tissue membrane - atrial (Reissner's) membrane. The lower part of the conch canal forms the basilar plate, which separates it from the tympanic ladder. The outer wall of the cochlea channel is made of a spiral connection (*(lig. spiral*) is formed, its upper part is rich in blood vessels,*(stria vascularis)*is called



Picture. 17.*Cross-section of the conch Cochlea*

1 - endolymph; 2 - covering membrane; 3 - epithelium; 4 – inner hair cells; 5 - cortilymph; 6 – outer hair cells; 7 - basement membrane.

The basilar plate has a wide network of capillary blood vessels and consists of transverse elastic fibers, the length and thickness of which increase from the main bend to the top. In the basilar plate, which is located in a spiral along the entire cochlear canal, there is a spiral (Corti) organ - the peripheral receptors of the auditory analyzer (Pic. 18).



Picture. .18.*Member of the Court:*

Spiral organ - consists of neuroepithelial inner and outer hairy, basal, outer and inner columnar cells. Inside the inner columnar cells there are a number of inner hair cells (about 3500 of them). Outside the outer columnar cells are about 23,000 outer hair cells (Pic. 19).

Hair cells are synaptically connected with peripheral nerve fibers coming from the cells of the cochlear spiral ganglion. The supporting cells of the spiral organ perform supporting and trophic functions.

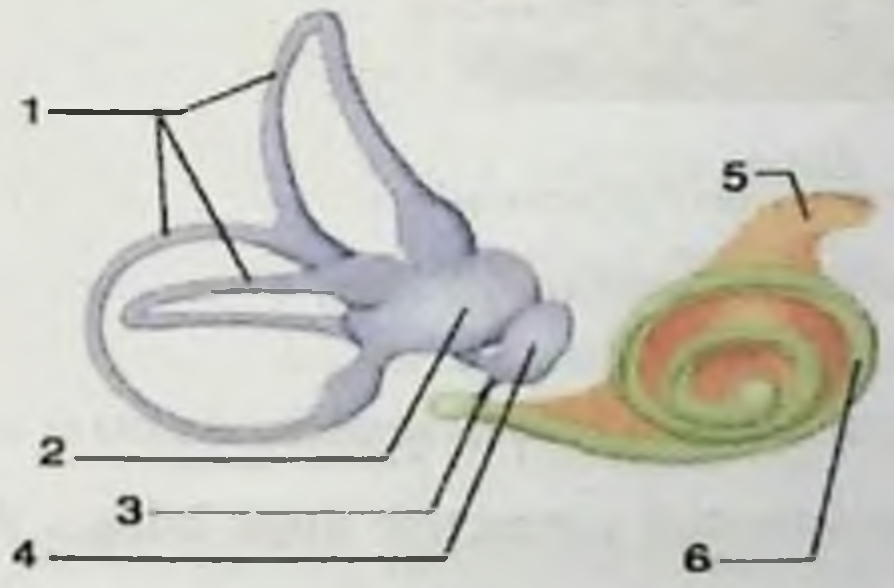
On the hair cells of the spiral organ, like the basilar plate, the internal membrane that protrudes from the edge of the bony spiral plate and hangs over the basilar (*membrane tectoria*) and its outer side is freely located.

Inner Ear Anatomy

Picture. 19.Hair cells:

The hairs of neuroepithelial hair cells are surrounded by an integral membrane. During the vibration of the basilar plate, the tension and compression of these hairs occurs, which leads to the conversion of the mechanical energy of the vibrations of the inner ear drum and fluids into the energy of an electrical nerve impulse. One terminal nerve fiber corresponds to each sensory hair cell.

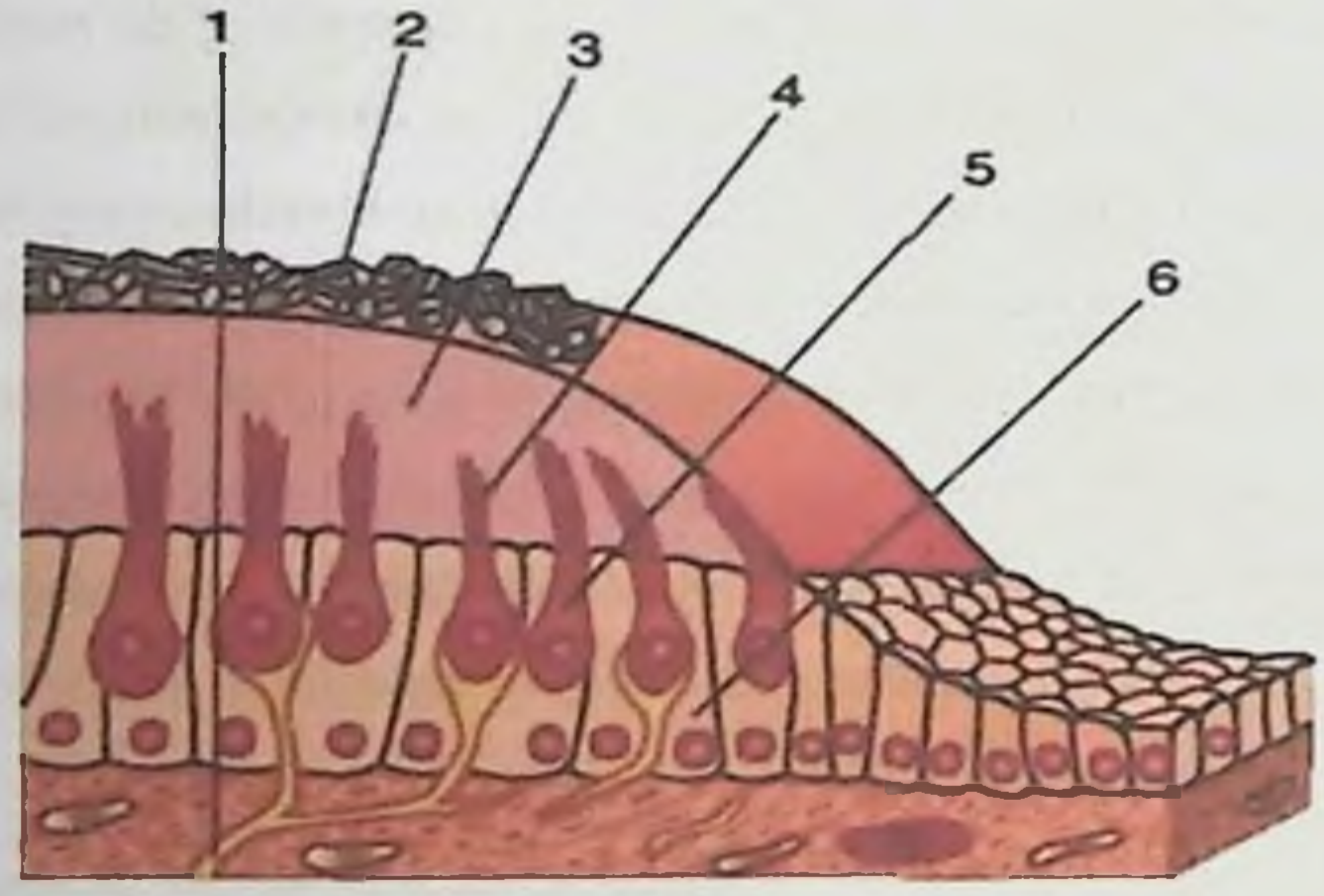
Membranous, or curtain labyrinth, is a closed system of cavities and canals, which are mainly repeated in the form of a bony labyrinth. Membrane labyrinth from two corridors*(utriculus et sacculus)*,from the three semicircular canals, the cochlear canal*(ductus cochlearis)*,endolymphatic duct*(endolymphatic duct)*and from the endolymphatic sac (*(endolymphatic sac)*consists of (Pic. 20).



Picture. 20. *Curtain labyrinth:*
1 – semicircular canals; 2 – elliptical bag;
3 – connecting road; 4 – spherical bag;
5 – auditory nerve; 6 – cochlea road.

All these sections are filled with endolymph and are connected to each other through thin channels. Corridor bags and semicircular canals are called balance organs. The receptors of the hearing aid are located in the cochlear canal.

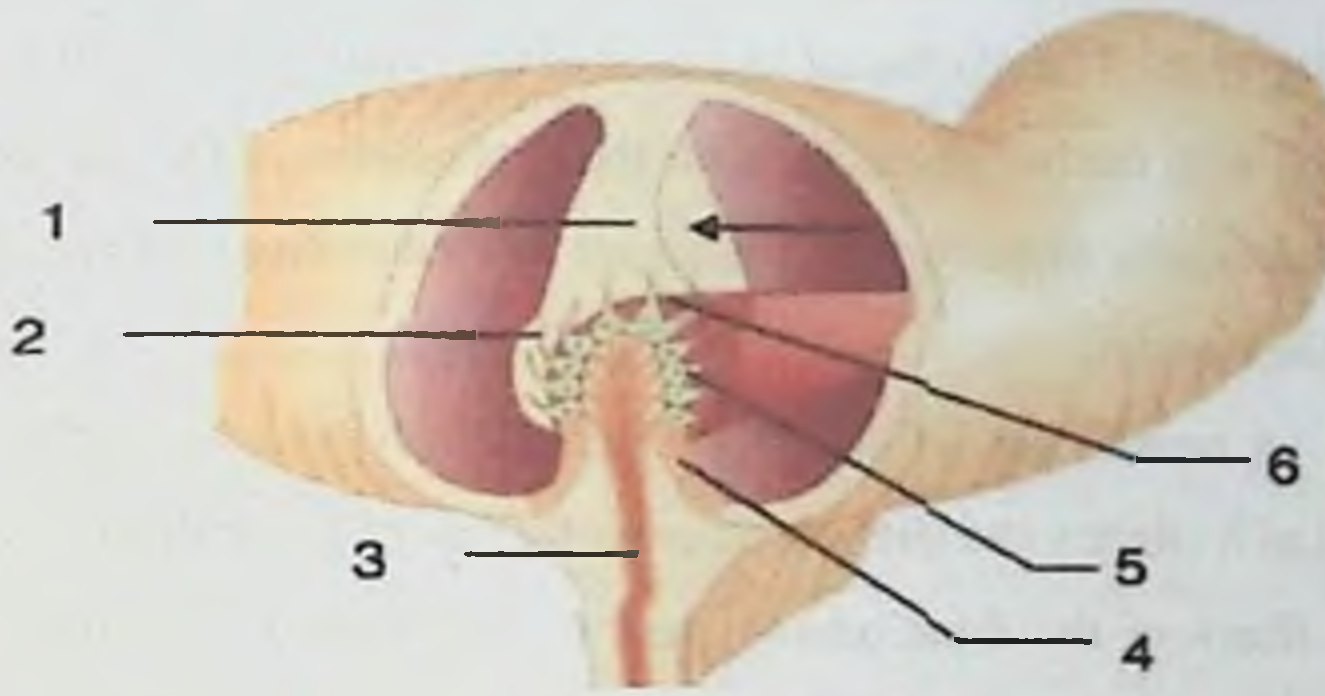
Membrane part of the corridor - from a thin channel connected with the endolymphatic channel*(ductus utriculo-sacccularis)*,and an interlocking spherical cap*(sacculus)*and from the elliptical bag*(utriculus)*consists ofThree ampullae and two smooth ends of the semicircular canals lead to the elliptical sac. A spherical sac in its lower part into the conch canal*(cochlear duct)*into the pouring connecting channel*(ductus reuniens)*passes. A whitish oval spot on the inner surface of spherical and elliptical cysts*(macula sacculi et utriculi)*there are elevations in the form They consist of receptors of the vestibular apparatus and hairs or sensitive, supporting cells (Pic.21). The hairs of the cells are wrapped in a gelatinous mass, on which there is a statoconium (otolith) membrane. It contains the hexagonal statoconium (otolith), which consists of the smallest crystals - calcium salts.



Picture: 21.*Otolith receptors: 1 - nerve fibers of vestibular nerves; 2 - otoliths; 3 - gelatinous mass; 4 - cilia (hairs of cells); 5 - sensitive hair cells; 6 – supporting cells.*

The membrane of the semicircular canals (ductus semicirculares) is attached to the periosteum of the bone canals through connective tissue bridges through which blood vessels pass. On the inner surface of each ampulla there is an ampulla

structure (crista ampullaris) consisting of supporting and neuroepithelial hair cells (Pic. 22). The latter has long hairs forming a terminal belt (cupula terminalis). Receptor cells are equipped with two types of hairs: one moving hair - kinocilia, and many stationary hairs - called stereocilia. When the endolymph of kinocilia moves, they move closer to or away from the stereocilia. As a result, neuroepithelial cells develop and a flow of impulses from the receptor cell occurs. Vestibular sensory cells are located in five receptor areas: one in each ampulla of the semicircular canal and one in each of the two sacs of the vestibule.



Picure 22.The structure of the ampulla of the semicircular canal: 1 - the last dome; 2 - hairs of sensory cells; 3 - vestibular nerve ending; 4 - base cells; 5 - hair cells; 6 – ampullary crown.

Blood supply of the inner ear Labyrinth is carried out through the artery*(a. labyrinth)*,and hebranch of the basilar artery*(a. basilaris)*serves as It passes through the internal auditory canal together with the cochlear nerve (VIII pair). A characteristic feature of the labyrinth blood supply is that the labyrinth artery does not have anastomoses with the middle ear vessels. The venous outflow from the inner ear goes along three paths: the cochlear aqueduct veins, the vestibular aqueduct veins and the veins of the internal auditory canal.

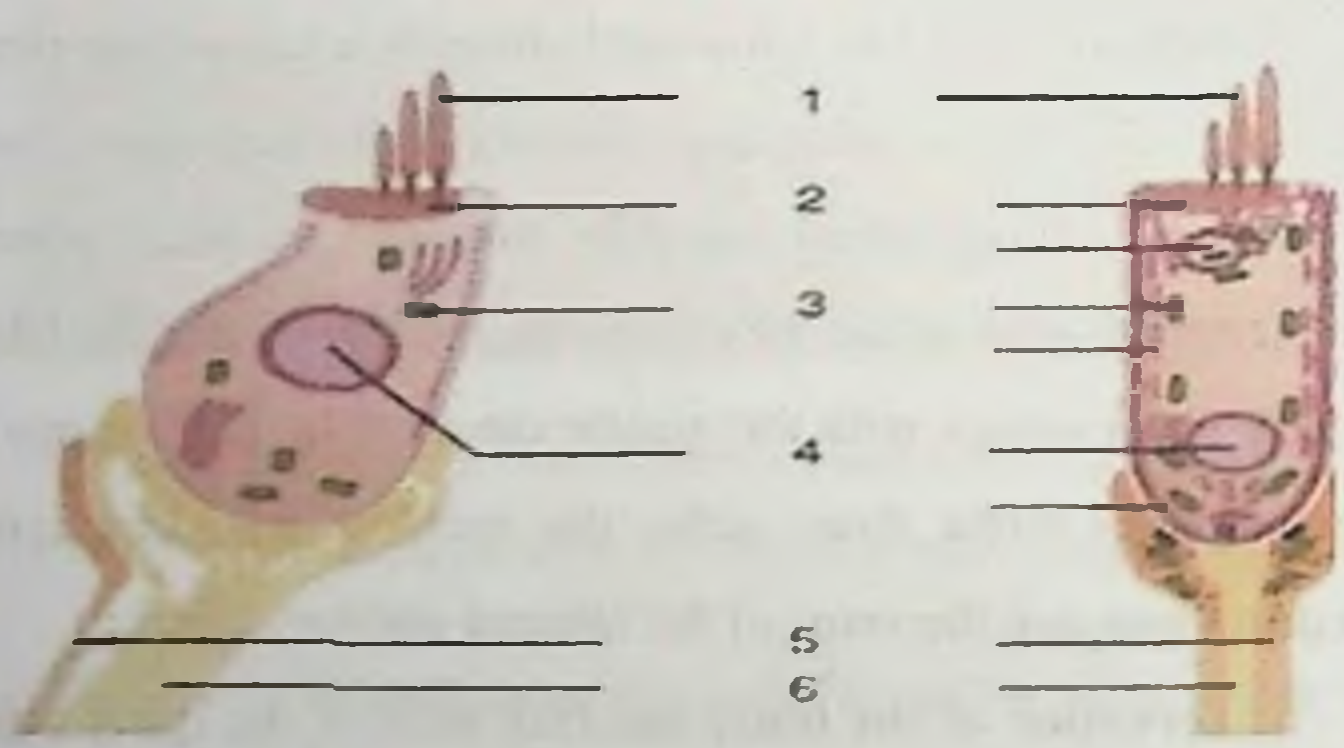
Innervation of the inner ear. Hair cells of the spiral organ Located at the base of the bony spiral plate of the cochlea spiral node of the cochlea *(gangl. spiral cochlea)* synaptically connected with peripheral processes of bipolar cells. Central

processes of bipolar neurons of the spiral node of the vestibular cochlea nerve*(n. vestibulocochlear)*The cochlea part is served by fibers, which pass through the internal auditory tube and enter the bridge in the area of the pons-cerebral angle (Pic. 23).

In the lower part of the IV ventricle, the atrial nerve divides into the carotid and atrial branches. The fibers of the cochlear hom are the anterior cochlear nucleus*(nucl. cochlearisventralis)*and posterior cochlea core*(nucl. cochlearis dorsalis)*ends with the lateral corner of the rhomboid remnant.

Thus, the cells of the spiral node together with the peripheral processes leading to the neuroepithelial hair cells of the spiral organ and the central processes ending with the bridge nuclei form the first neuron of the auditory analyzer. The second neuron of the auditory analyzer originates from the anterior and posterior cochlear nuclei.

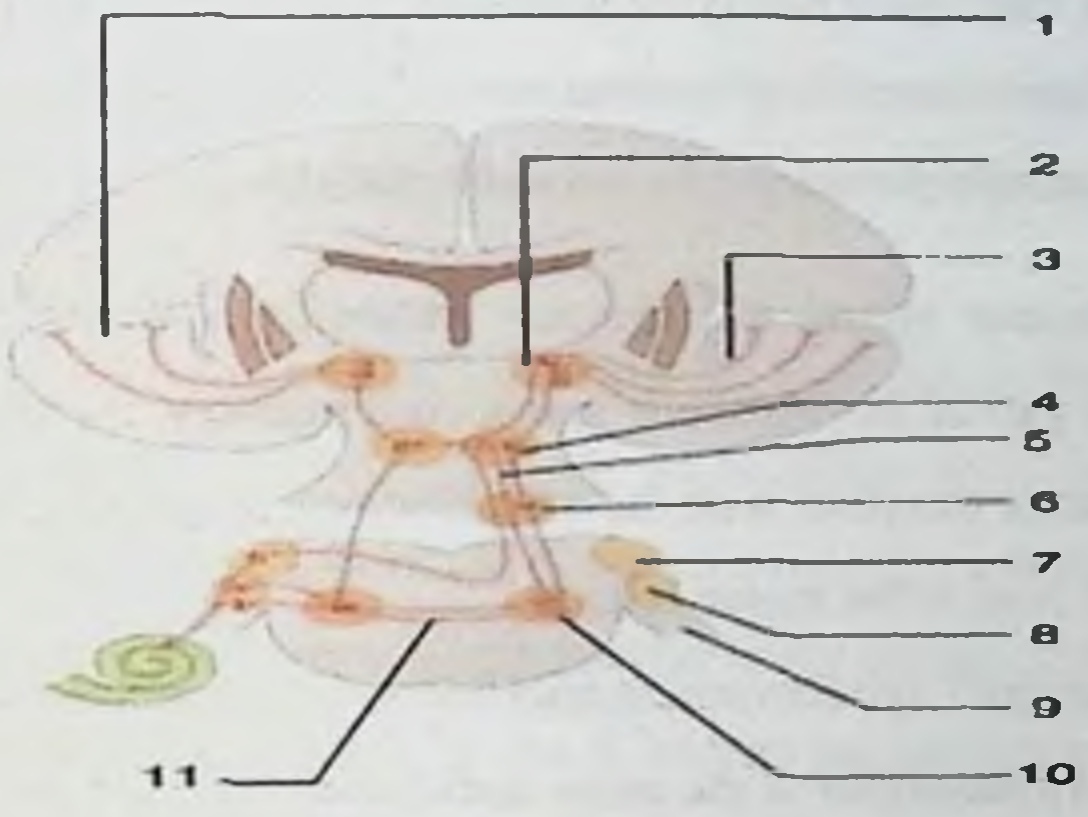
A smaller part of the fiber of this neuron passes with the same name, and most of it crosses and goes to the opposite side of the bridge that ends in the olive. The fibers of the third neuron pass to the nuclei of the quadrate and medial geniculate body as part of the lateral plexus, from where the fibers of the fourth neuron, after the second partial intersection, are sent to the temporal lobe of the brain and located in the transverse temporal lobe (Genschli area) The analyzer ends in the bark.



Picture.23. *vestibulocochlear nerve*

The auditory system provides reception of sound vibrations, transmission of nerve impulses to auditory nerve centers and analysis of received information (Pic. 24). The fibers of the vestibular nerve originate from the sacs of the vestibule and ampullae of the semicircular canals and reach the vestibular node at the bottom of the internal auditory tube.*(gangl. vestibulare)*is interrupted by In the inner auditory tube, vestibular branchVIIIjoining the pair, then goes to the medulla oblongata, where it ends with the lateral, medial, superior and inferior atrial nuclei.

These nuclei have connections with other parts of the central nervous system, and some of the fibers pass to the side with this name, and some cross.



Picure: 24.*The central part of the auditory analyzer: 1 - the cortical section of the auditory analyzer; 2 - four apical nuclei; 3 - IV neuron; 4 - internal knee-shaped body; 5 - III neuron; 6 - the nucleus of the lateral ring; 7, 8 - auditory nerve nuclei; 9 - auditory nerve; 10 – olive core; 11 - II neuron.*

From the point of view of clinical anatomy, it is important to note the five main connections of the atrial nuclei with different formations of the central nervous system (Pic. 25).

Picure 25.*The central part of the vestibular analyzer: 1 - labyrinth; 2 - corridor node; 3 - cerebellum; 4 – cortex of cerebral hemispheres; 5 – nerve nucleus that moves the eye; 6 - reticular formation; 7 - vestibular nuclei in the long brain; 8 - spinal cord.*

Corridor spinal tract*(tractus vestibulospinalis)*.Starting from the lateral nuclei, as part of the vestibular spinal cord pathway, it provides the connection of the vestibular receptors with the muscular system, passing the anterior branches of the spinal cord to the motor cells.

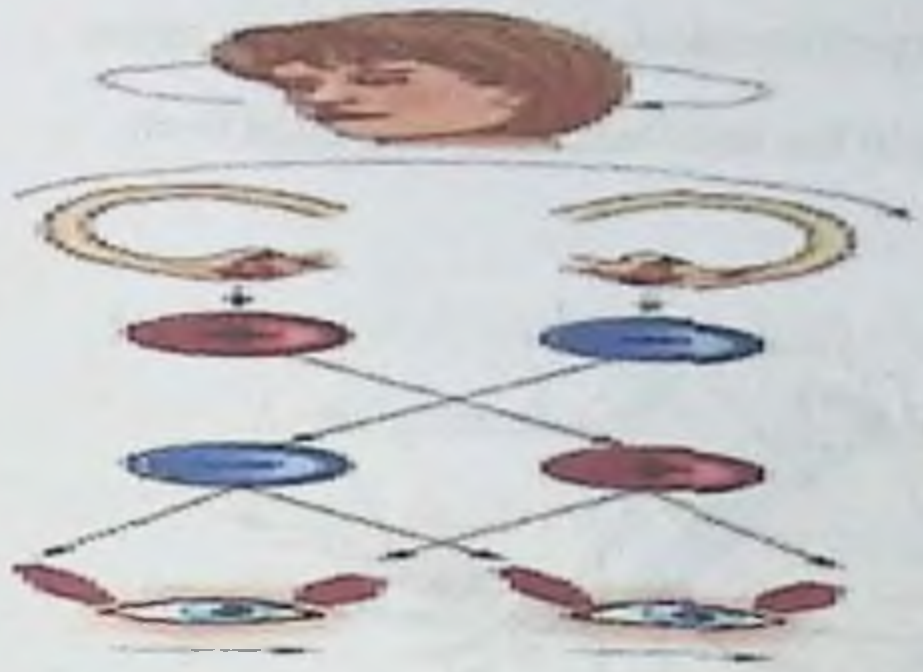
Corridor - eye movement tract*(tractus vestibulooculomotorius)*.The corridor passes from the nuclei to the nerve nuclei that move the eye.

Corridor-vegetative path ((tractusvestibuloreticularis). Passes from vestibular nuclei to stray nerve nuclei, reticular formation, diencephalic area.

Corridor - cerebellar tract (tractus vestibuloserebelliaris). Provides communication of the vestibular nuclei with the cerebellar nuclei.

Corridor - cortical tract (tractus vestibulocorticalis). The corridor passes from the nuclei to the cortex of the occipital and parietal lobes of the brain, where the hall analyzer has a diffuse appearance. The cerebral cortex and the cerebral cortex perform a regulatory function in relation to the analyzer.

Different sensory, autonomic and somatic vestibular reactions are realized by means of these connections. (Pic. 26).



Pic. 26. Vestibuloocular reflex

Corticosteroid nerve (n. vestibulocochlearis). The main functions are to provide hearing and balance. The nerve consists of 2 functionally different parts: auditory part (pars cochlearis) and vestibular part (pars vestibularis). (Pic.27).

I. Hearing part.

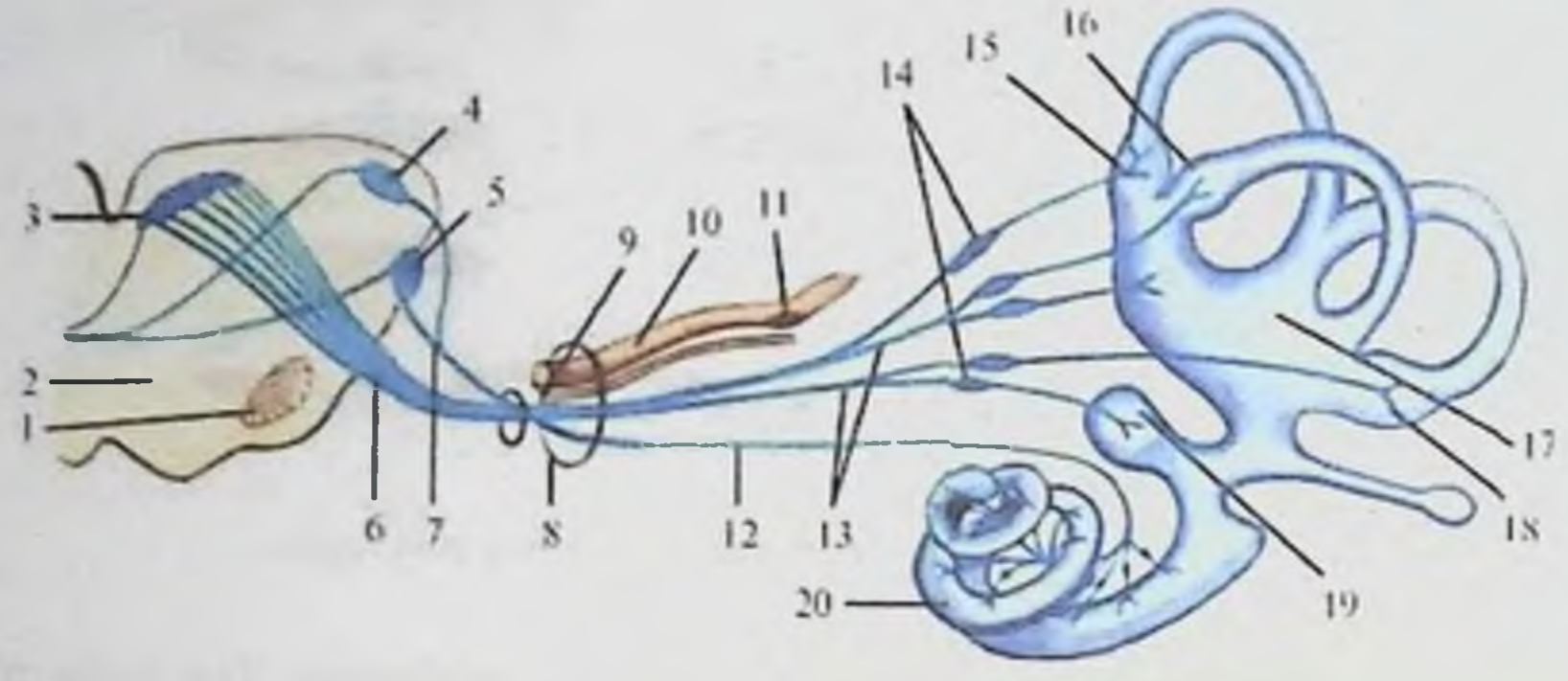
Auditory pathways consist of 3 neurons. Neuron I lies in the spiral ganglion (ganglion spirale cochleae) in the labyrinth. Its dendrites go to the periphery and end in the Cortiiv azo. The axons of the porus acusticus internus enter the cavity of the cranial cavity and end in two nuclei located in the bridge, that is, the anterior and posterior cochlear nuclei. Part of the II neuron pathways starting from these nuclei goes to the opposite side, and the rest goes up from its side and ends in colliculus inferior and corpus geniculatum mediale.

Neuron III lies in the corpus geniculatum mediale. Its impulses pass through the posterior femoral organ of the internal capsule and end in the projection area of the auditory analyzer located in the cortex of the upper temporal lobe. This area is also known as Geschl's breast.

II. Vestibular part. The vestibular system consists of 3 neurons. Neuron I with a bipolar structure lies in the scarp node located at the bottom of the meatus acusticus internus. Its dendrites go to the periphery and end in the vestibular apparatus. The vestibular apparatus consists of the utriculus and the sacculus.

Bipolar neuron axons bundle together to form the vestibular nerve. This nerve merges with the auditory nerve n. forms the vestibulocochlearis and passes

into the cavity of the skull through the porus acusticus interims organ. Then they end up going to the vestibular nuclei located in the brain stem.



Picure 27. *VIII nerve (n. vestibulocochlearis).*

1 - olive; 2 – corpus trapezoidum; 3 – vestibular nucleus; 4 – nucleus cochlearis dorsalis; 5 – nucleus cochlearis ventralis; 6 – radix vestibular; 7 – radix cochlearis; 8 – meatus acusticus internus; 9 – n. intermedius; 10 – n. facial; 11 – ganglion geniculi; 12 – pars cochlearis; 13 – pars vestibularis; 14 – vestibular ganglion; 15 – anterior ampulla membranacea; 16 – ampulla membranacea lateralis; 17 – utriculus; 18 – posterior membranous ampulla; 19 – sacculus; 20 – cochlear duct.

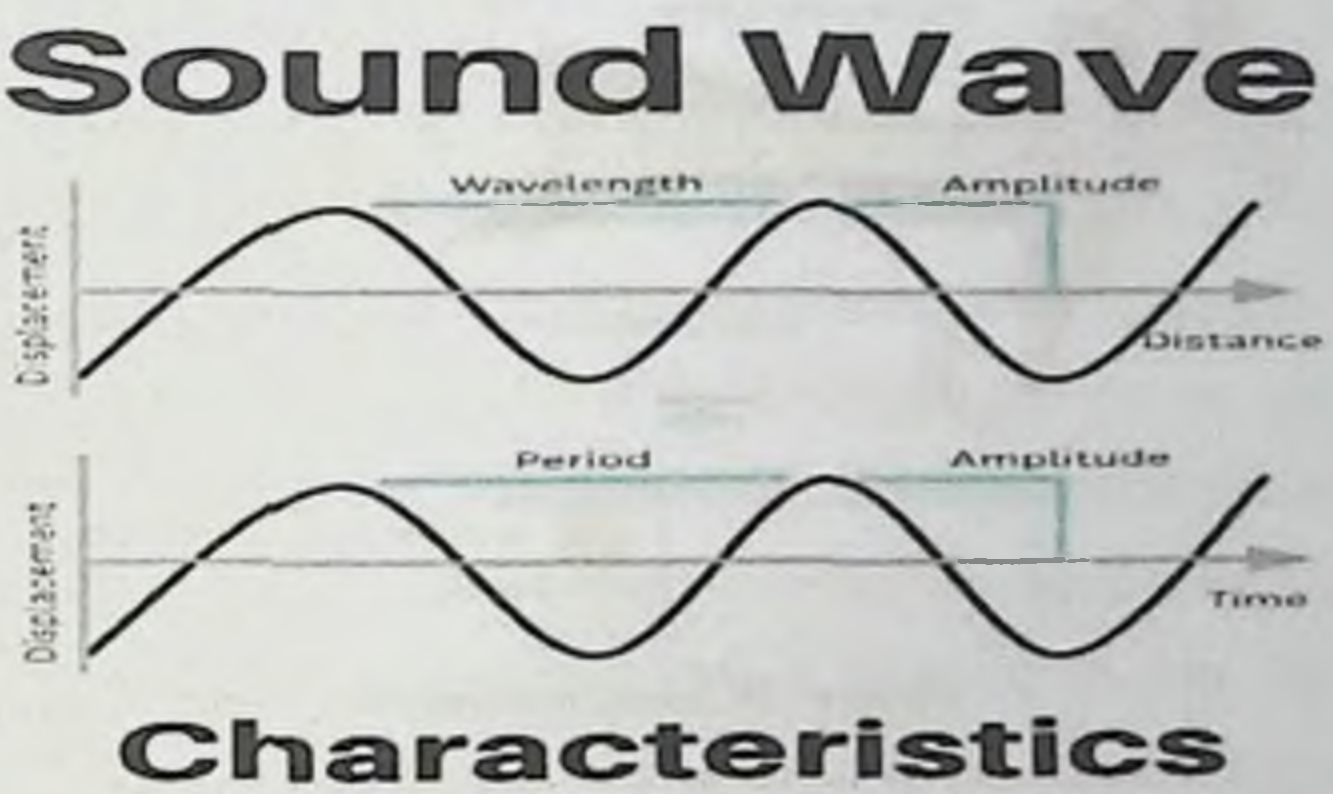
1.4. Clinical physiology of the ear

The first sound is considered a suitable stimulus for the auditory analyzer. The latter reflects the mechanical vibrations of an elastic medium that propagate in the form of waves in air, liquids, and solids. A sound wave is characterized by sinusoidal oscillations (Pic. 28). The speed of sound propagation in air is 332 m/s, in water it is 1450 m/s. The voice analyzer allows you to distinguish sounds based on pitch, intensity and timbre. Loudness depends on the number of vibrations per second of the sound-emitting body, which is measured in hertz (Gs) - the number of vibrations per second. The human sound analyzer receives sounds with a vibrational frequency of approximately 16 (lower limit) to 20000 Gs (upper limit). Sound vibrations below 16 Gs are called infrasound, and above 20,000 Gs are called ultrasound.

A necessary condition for sound perception is a sufficient intensity of sound power - vibration amplitude. The highest sensitivity of the sound analyzer is from 1000 to 4000 Gs.

Human speech occupies the zone from 300 to 3000 Gs in the sound field. Loud sound amplification (> 130 dB) causes a feeling of pressure and pain in the ear. The relative intensity of sound is usually expressed in special units - decibels (dB).

Increasing or decreasing the sensitivity of the hearing analyzer under the influence of sound is called adaptation. The sensitivity of the ear decreases under the influence of loud sounds, and it becomes more acute in silence.



Picture: 28.Sound wave

Ototopica is the ability to recognize the direction of sound and is related to binaural hearing. The difference in the perception of sound power is also explained by the difference in the arrival time of the sound wave to the right and left ear. The direction of sounds propagating in the horizontal plane is determined by mistake.

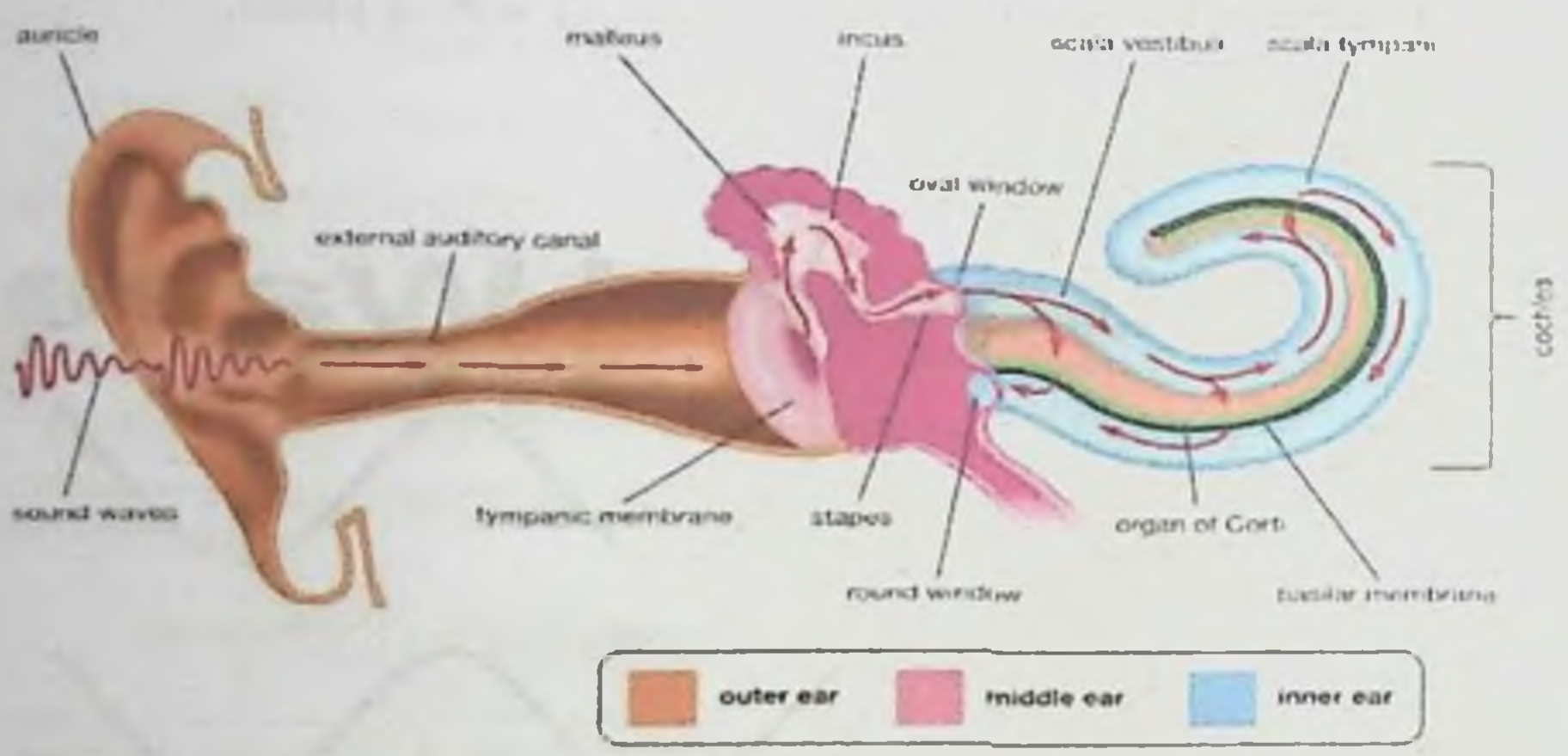
Functions of the outer, middle and inner ear

The ear has two main functions:

• sound transmitter - conveying sound energy to the receptor apparatus of the Cochlea;

• sound acceptance- converting the energy of sound vibrations into nerve impulses.

According to these functions, sound-transmitting and sound-receiving devices are distinguished in the ear (Pic. 1.29).



Picture: 29.Sound transmission function of the ear

Sound transmission. This process is carried out with the participation of the auricle, external auditory canal, tympanic membrane, chain of auditory ossicles (hammer, auricle, tinea), inner ear fluids, perilymph, endolymph, vestibular, basilar and integral membranes. The auricle plays the role of collecting sound waves. The external auditory canal serves as a conductor of sound waves to the eardrum. The tympanic membrane and the auditory ossicles attached to it transmit the air vibration to the auditory canal intact. The bony chain with the eardrum and muscles is considered a variable mechanism: they convert sound vibrations of a large amplitude and relatively small force into vibrations of the labyrinth fluid with a

relatively small amplitude but high pressure. This is due to the fact that the area of the base of the extension is about 20 times less than the area of the drum curtain. That is why the sound falling on the eardrum is concentrated on a smaller surface.

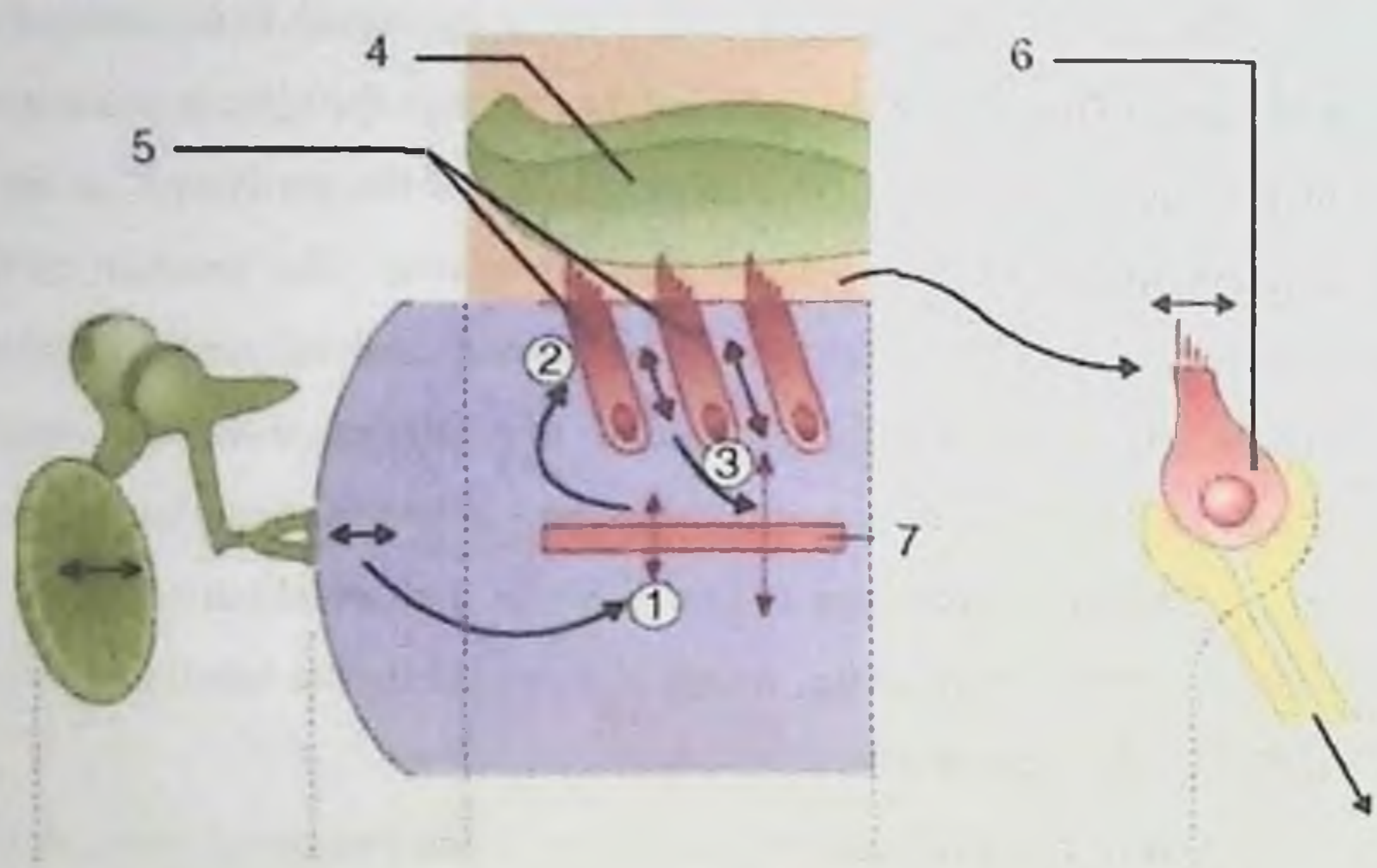
In addition, the sound pressure from the stirrup is transmitted through the perilymph of the stair of the hall, and then through the helicotrema to the perilymph of the stair of the drum. The displacement of the perilymph occurs due to the correspondence of the cochlear glass membrane. The function of the auditory muscles is mainly to protect the inner ear and its receptor apparatus from excessively strong sounds. In addition, they perform a flexible muscle function, which provides the most comfortable tension in the sound-conducting system of the middle ear. A necessary condition for normal sound transmission is normal air pressure in the drum cavity, which is provided by the ventilation function of the auditory tube (see Pic. 29).

Sound reception. Sound perception is the process of converting the energy of sound vibrations into a nerve impulse, conveying it to the centers of the cortex of the cerebral hemispheres, analyzing and understanding sounds. The sound wave reaching the perilymph through the glass of the corridor attracts it to the vibrational movements. These vibrations travel along the folds of the Cochlea, to the top of the stairs of the hall, from there they pass to the drum stairs and return to the bottom of the cochlea, causing the secondary drum curtain to bend. Oscillations include the basilar membrane and the spiral organ located above it, the sensitive hair cells of which are compressed or pulled by the entire membrane during these oscillations. The elastic deformation of hair cells is the basis of their impact properties. Thus, there is a transformation of mechanical sound vibrations into electrical nerve impulses (Pic. 30).

Various theories of hearing have been proposed to explain the processes of sound perception that occur in the inner ear.

It was fully explained by the German physicist and physiologist German von Helmholtz in the 18th century. Inspired by Corti's anatomical studies, Helmholz imagines placing resonators in the eardrum capable of breaking down complex

sounds into their component parts. After considering other structures, he concluded that the transverse fibers of the basement membrane increase in length and decrease in tension from the basal end to the apex, these are resonators.



Picure 30. *Transmission of sound vibrations (diagram): 1 - perilymph; 2 - endolymph; 3 - auditory nerve; 4 - integral membrane; 5, 6 - hair cells; 7 - basilar membrane*

However, Helmholtz's theory did not last long as many experiments and clinical observations supported the "Local Theory" which was strongly associated with it. According to this theory, sounds of different frequencies activate different parts of the basal end of the basal membrane of the torsion organ.

Helmholtz theory (resonance) was proposed as early as 1863. According to this theory, sound waves cause vibrations of the basilar membrane of the conch canal. Since the fibers of the latter are not the same in terms of length and tension, selective resonance of different areas occurs to sounds of unequal pitch. Each fiber, like a stretched string, corresponds to the corresponding tone. According to this theory, low sounds cause parts of the basilar membrane to vibrate.

Low sounds are received at the top of the Cochlea, and high sounds are received at its base. Thus, the primary analysis of sounds takes place. Helmgols theory was the first to explain the basic characteristics of the ear - the ability to determine pitch, sonority and timbre. This theory is still considered a classic.

Other theories follow Helmholtz theory. Of particular interest is the theory of Nobel laureate Bekesh (1961). He developed the hydrodynamic theory or traveling wave theory. According to him, the excitation of individual cells of the sensitive neuroepithelium of the spiral organ is a hydrodynamic process and is associated with the appearance of moving waves in the perilymph of the inner ear. The feeling of stiffness arises due to the fact that the basilar membrane affects the hair cells located at the point of maximum bending. The disadvantage of these theories is that, from a mechanical point of view, it is impossible to understand the ability of the ear to separate different frequencies.

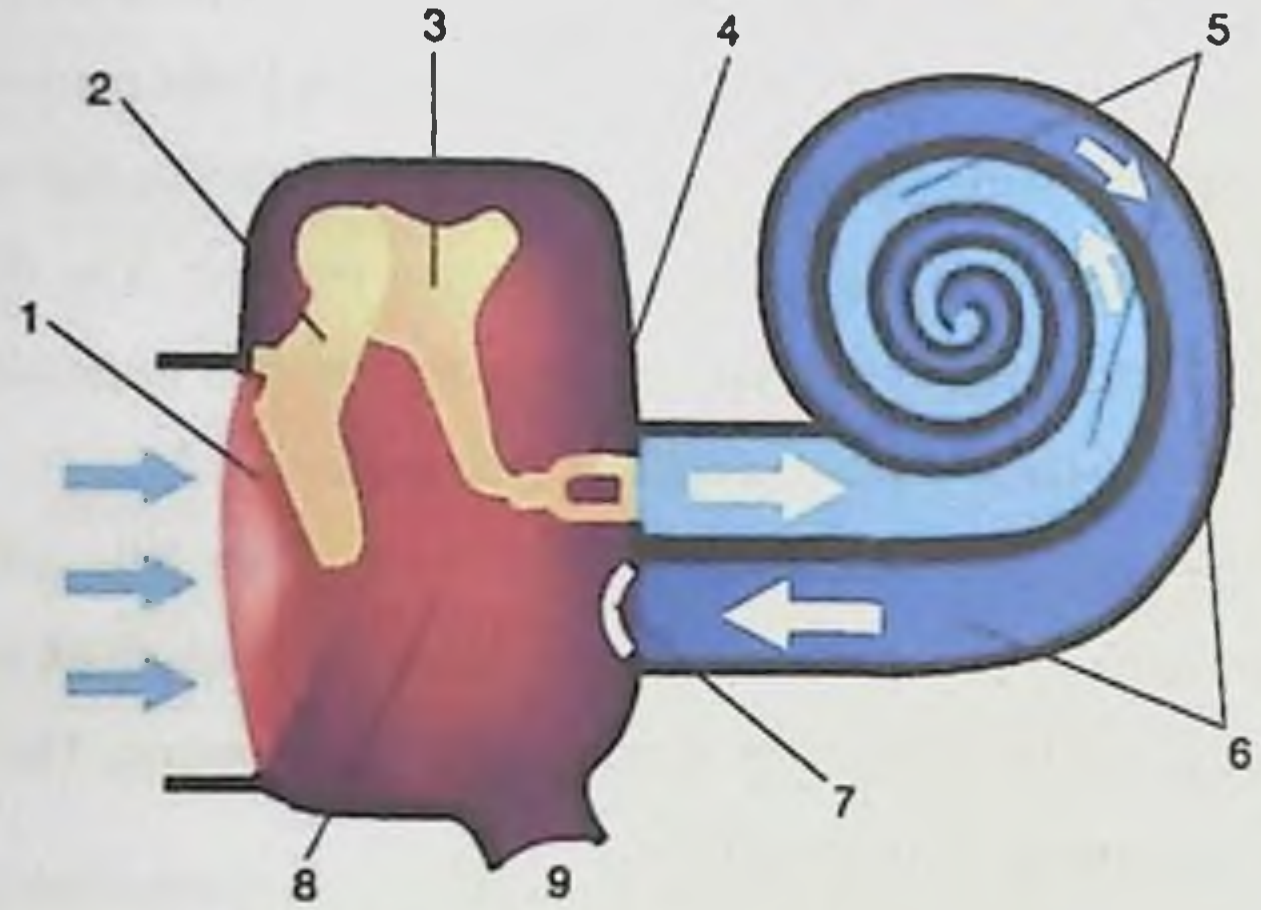
According to PPLazarev's ion theory, when hair cells are mechanically affected, a chemical reaction occurs in them, the strength of which depends on the amount of the disintegrating substance (auditory purpura). The ions released during this process cause nerve impulses.

When the sounds affect the hearing organ, a microphone potential appears in the Cochlea under the influence of an electric current - the same as the frequency of the sound. After amplifying this current using special equipment, it can be converted back into sound. Sound sensation occurs in the cortex of the auditory analyzer, in the temporal part of the brain, where the highest analysis and synthesis of complex sound stimuli is carried out.

Middle ear physiology

The auditory tube, as mentioned, performs protective functions and affects the nerve endings in the cochlear by equalizing the pressure in the drum cavity to the state of the main function of the drum cavity - sound vibrations in the inner ear. The chain of auditory bones, the functions of the tympanic membrane and the labyrinthine glass decrease until the vibrations caused by the sound are transmitted

to the fluid in the inner ear - perilymph. Thus, its movement should be from the vestibular mirror to the Cochlea mirror. The eardrum captures the vibrations of the air column in the ear canal. Due to the specific properties of resonance, it almost does not absorb sound energy, sound vibrations amplified by the network of auditory bones reach the hall window and are amplified approximately 27 times. This is necessary for the transfer of sound energy from a less dense medium, i.e. air, to a denser medium - perilymph.



Picure 31.*Movement of the perilymph from the hall window to the Cochlea window under the influence of the pressure of the rupture base (diagram): 1 – drum curtain; 2 - hammer; 3 - chest; 4 - long; 5 - drum ladders; 6 – Cochlea ladder; 7 – Cochlea glass membrane; 8 - drum cavity; 9 - auditory tube.*

The sensitivity of this system is so great that it can transmit vibrations with a wavelength equal to the diameter of a hydrogen molecule. Fluid movement in the inner ear is possible only when the membranes of both glasses are moving. If there are conditions in the hall glass that prevent the movement of the membrane in the long or cochlea glass, then the displacement of the perilymph does not occur, because the fluids are almost incompressible. Hearing loss is associated with a violation of the sound-conducting system.

In addition to holding sound vibrations, the eardrum plays the role of a "screen" that protects the membrane of the cochlea glass from the direct pressure of the sound wave in the phase of the same name.

If there is a defect in the tympanic membrane, then the sound wave moves with almost the same force in both windows, which reduces the ability of the perilymph to pass from the hall glass to the cochlea glass.

Vestibular analyzer function

The history of studying the activity of the semicircular canals is very long. The acquisition of valuable information about their physiology began in 1820 BC.

Purkinje, who conducted an experiment on himself, pointed out that when he rotated to the right around the vertical axis with his eyes closed, while burning his fingers on the eyelids of his closed eyes, he felt the movement of the eyeball, from the rotation when he suddenly stopped, Purkinje fell towards the direction of rotation, when he opened his eyes, objects seemed to move to the right, and he himself. In addition, nausea and excessive sweating were observed. He called this condition dizziness.

The idea of the importance of the semicircular canals in maintaining the balance of the living organism arose after the study of Florence. He cut the semicircular canals in pigeons and for the first time observed statokinetics and head movements accompanying vomiting in pigeons.

Gols was the first to suggest that the semicircular canals are a peripheral organ responsible for movement in space and rest in humans and animals. This assumption of Gols remained hypothetical, that is, hypothetical, until it was confirmed by the researches of Mack, Breyer and Ewald. Mak came to the conclusion based on his experiments with humans and animals spinning in a centrifuge: the excitation of the ampullary nerves during rotation depends not on the speed of rotation, but on the decrease in endolymph pressure, which is related to the angular speed.

Brayer's experiments were more reliable than other experiments. He opened a semicircular channel with a dovetail and blew air into it. At this time, the pigeon began to shake its head, and its eyeballs also began to move towards the surface of the experiment channel. When the air is pushed out of the channel, the movement is directed in the opposite direction. Brayer believed that such experiences arose from the flow of endolymph, which in one case was directed from the normal side to the ampulla, and in another from the opposite direction.

Hedej's research on the joint movement of the eyeballs caused by vestibular stimuli in the brain axis is very interesting. He showed which parts of the brain could be removed without damaging the vestibular reflexes, eye reflexes, and concluded that the vestibular nerves contract the muscles of the eyeballs.

The Russian scientist Lyon was the first to describe the balance organs and their relationship with space. "The semicircular canals are the essence of the spatial character of the peripheral organs, that is, the sensations called by the nerve endings in the ampulla serve for our understanding of the three dimensions of space." Bekhterev emphasizes the influence of the large hemispheres of the brain on vestibular reactions. Bekhterev's experiments serve to initiate the study of the effect of various derivatives of the central nervous system on inner ear reflexes. This period ends with the technical excellence of Ewald's experiments.

Evald completely blocked the semicircular path of the pigeon by filling it with a cork, and by pressing a part of the path between the ampulla and the cork with an air hammer, he called the movement of the endolymph towards the ampulla. At this time, there was a tremor of the eye on the side of the canal, which was kept closed. When the pressure with the ball was stopped, the endolymph moved from the ampulla to the normal peduncle, and then the movement of the eyeball in the opposite direction occurred. But Ewald's experiments could not give a clear answer to the question whether the pressure or endolymph flow changes in the semicircular canals. Mayer, Lyon and Undritz solved this problem with their research. They made glass capillary tubes and filled it with a suspension of

lycopodium or red blood cells, turned the person around and clearly observed the flow of the suspension using a microscope.

Brayer's theory is based on intuition, but has not yet deviated from this theory. Sevel dult thin sheet sea fish stones removed. After that, the fish could not swim and sank to the bottom. Research conducted at the beginning of the 20th century made it possible to study the mechanism of stone apparatus in detail and revealed its physiological significance.

The otolith-stone apparatus provides analysis of the direction of the earth's gravity (gravitational vertical) and its movement along a straight line. It is considered a gravitational-inertial indicator, which can be considered a physical vibration in a different form.

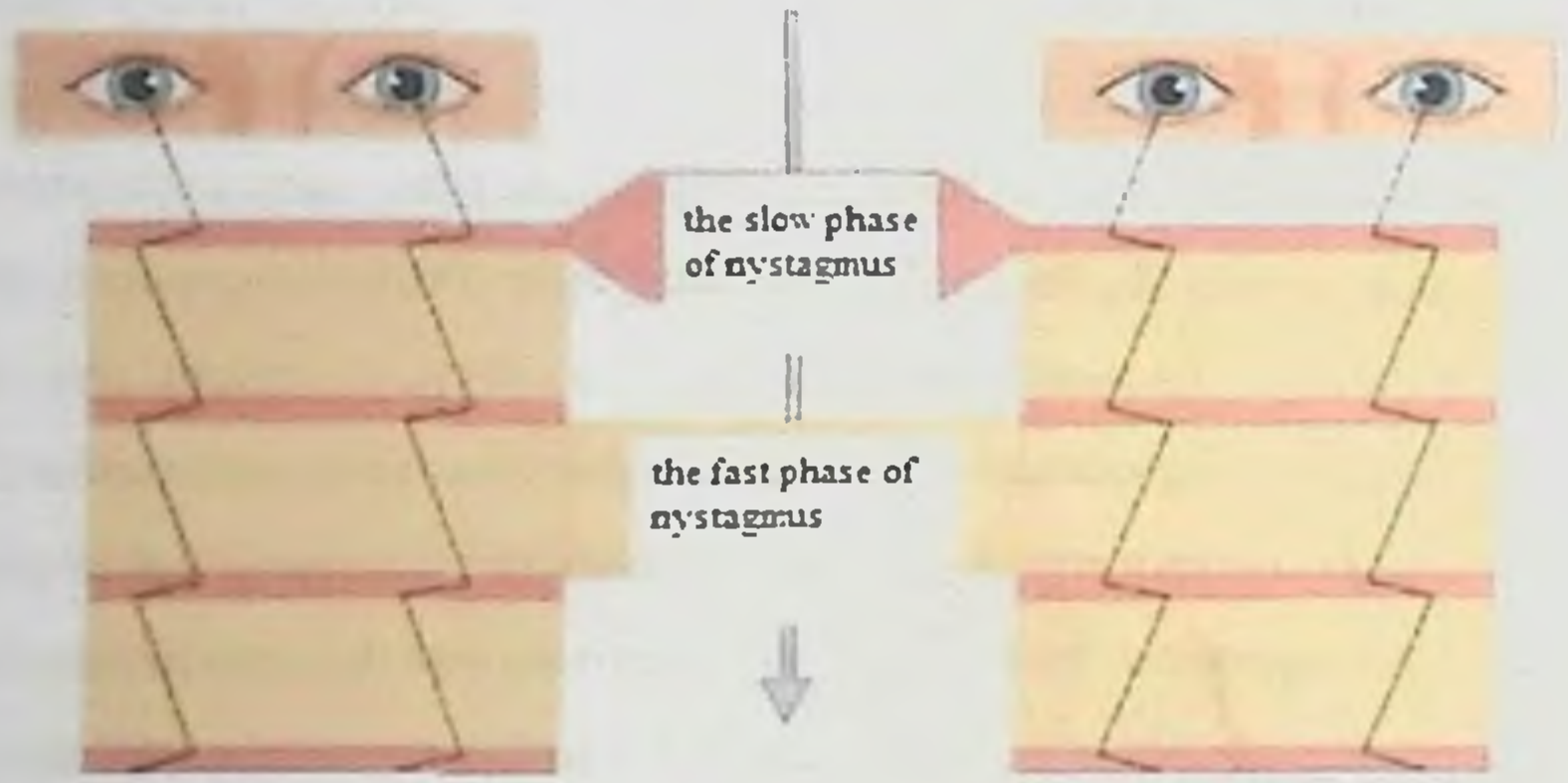
Thus, the labyrinth part of the vestibular analyzer can be considered as an inertial-gravitational indicator based on all known laws of mechanics. The characteristics of the pointer are complex, and their analysis provides a polarized receptor system for separating and analyzing simple components of the motion (gravitational force of the earth, motion along a straight line, and angular acceleration). Signals about circular movement occur in semicircular channels, and in straight line movement, the earth's gravity and centripetal forces are received by the stone apparatus. In this case, the substitution of the semicircular pathways and the petrous apparatus in the primary analysis of the vestibular stimulus is important, since the semicircular pathways can be affected by acceleration in a straight line. proved.

The vestibular analyzer, together with the proprioceptive and vision systems, provides body balance, accurate coordination and analysis of movements.

Angular acceleration (rotational motion) is considered a sufficient stimulus for the ampullary receptors of the semicircular canals. During rotational movement, under the influence of angular acceleration or deceleration, the endolymph moves with inertia and moves the kinocilia. The displacement of the endolymph occurs in the channel corresponding to the plane of movement.

Thus, with angular acceleration in the horizontal plane, the endolymph moves mainly in the lateral semicircular canals, and with acceleration in the vertical plane, in the anterior or posterior canals. The movement of kinocilia causes the neuroepithelium of the ampullary ridge, which is transmitted along the vestibular nerve fibers to the nuclei and the vestibular center in the cortex of the cerebral hemispheres. The vestibular analyzer causes a number of somatic, autonomic reflexes and sensory reactions due to its many connections with the oculomotor and vagus nerves, cerebellum and spinal cord nuclei.

Reflexes in the eye muscles are manifested as vestibular (labyrinth) nystagmus, which is characterized by rhythmic oscillation of the eyeball with a small amplitude, slow and fast component (Pic. 32).



***Picture: 32.** Vestibular nystagmus*

The origin of the slow component of nystagmus is related to the effect of the receptors and nuclei in the brain column, and the fast part is related to the compensatory effect of the cortex or cortical centers of the brain. This is confirmed by observing the disappearance of the rapid component of nystagmus during deep anesthesia. The direction of nystagmus is determined by the fast component. Nystagmus is always directed towards the labyrinth, which is characterized by a strong effect.

The working order of the vestibular analyzer was presented by the German physiologist Ewald. In 1892, he described the results of experiments to determine the dependence of vestibular reactions on pigeons on the influence of one or another semicircular canal and the direction of movement of endolymph in it.

The results of these observations are known as Ewald's laws.

• Reactions originate from the semicircular canal located in the plane of rotation.

• The direction of movement of endolymph in the space of the semicircular canals corresponds to the direction of the slow component of nystagmus.

• The flow of endolymph into the ampulla (ampulopetal flow) in the lateral semicircular canal causes a strong reaction compared to the flow from the ampulla (ampulofugal flow). In vertical channels, this pattern is reversed.

Reflexes in the muscles of the neck, limbs, and trunk are caused by constant impulses that emanate from both labyrinths and maintain a state of equilibrium. When the vestibular apparatus is affected, this balance is disturbed.

Reflexes of the autonomic nervous system include nausea, vomiting, pale skin, cold sweat, acceleration and deceleration of the pulse, increase or decrease in arterial blood pressure, narrowing or dilation of the pupils, collapse.

A sufficient stimulus for otolith receptors is a change in the direction of the gravitational force relative to the otolith receptor (which occurs when the head deviates from the vertical position), acceleration and deceleration of rectilinear movement, as well as centrifugal force is considered In this case, the otoliths in the atrial sac are displaced, exerting pressure or pulling the hairs of sensitive cells. In the cortical part of the analyzer located in the back of the brain, in the interaction of the vestibular analyzer with other systems, there is a conscious visual and proprioceptive perception of the position and movement of the body in space.

1.5. Methods of examination of the outer and middle ear

Examination of the outer and middle ear begins with the study of complaints, which allows you to think about the nature of the disease, the localization of the

pathological process. Inspection, palpation of the external ear area, gives an idea about the condition of the mastoid tumor and other parts of the ear (swelling of the auricle and mastoid tumor, pain when touched) : may indicate lymphadenitis of the ear area, furuncle of the external auditory canal or mastoiditis. The main method of examination of the outer and middle ear is otoscopy - examination of the cavity of the external auditory tube and eardrum (Pic. 1.33).

Otoscopy rules. The patient sits with the examined ear facing the doctor. The doctor directs the light of the reflector to the area of the external auditory canal.

Picture. 33.Otoscopy

To examine the right ear - the ear funnel is inserted into the initial parts of the auditory canal with the right hand, and the ear is pulled back and up with the left hand (see Pic. 33). To examine the left ear, on the contrary, traction is done with the right hand and the ear funnel is inserted with the left hand. The diameter of ear funnels is different, it is selected depending on the width of the external auditory tube of the patient. The ear funnel inserted into the ear canal can move slightly up and down, right and left, which allows a detailed examination of all parts of the eardrum.

In addition to examination with ear funnels and Zigley pneumatic ear funnels, it is sometimes necessary to resort to a microscope, which allows you to see the tympanic membrane with a magnification of 5 to 32 times (Pic. 34).

Picture. 34.Zigli ear funnels withOtoscopy,Otoscopy under a microscope

Examination of the tympanic membrane - the doctor will have enough information only when he sees all the identification points (Pic. 35), as well as possible changes in its stretched and unstressed part (perforation, stretching , the absence of a cone of light, etc.) notes.

Picure 35.Normal tympanic membrane and detection points: 1 – fibrous ring; 2 – long growth of the sacrum; 3 - a short protrusion of the hammer handle; 4 - the front wall of the auditory tube; 5 - light cone; 6 - hammer handle

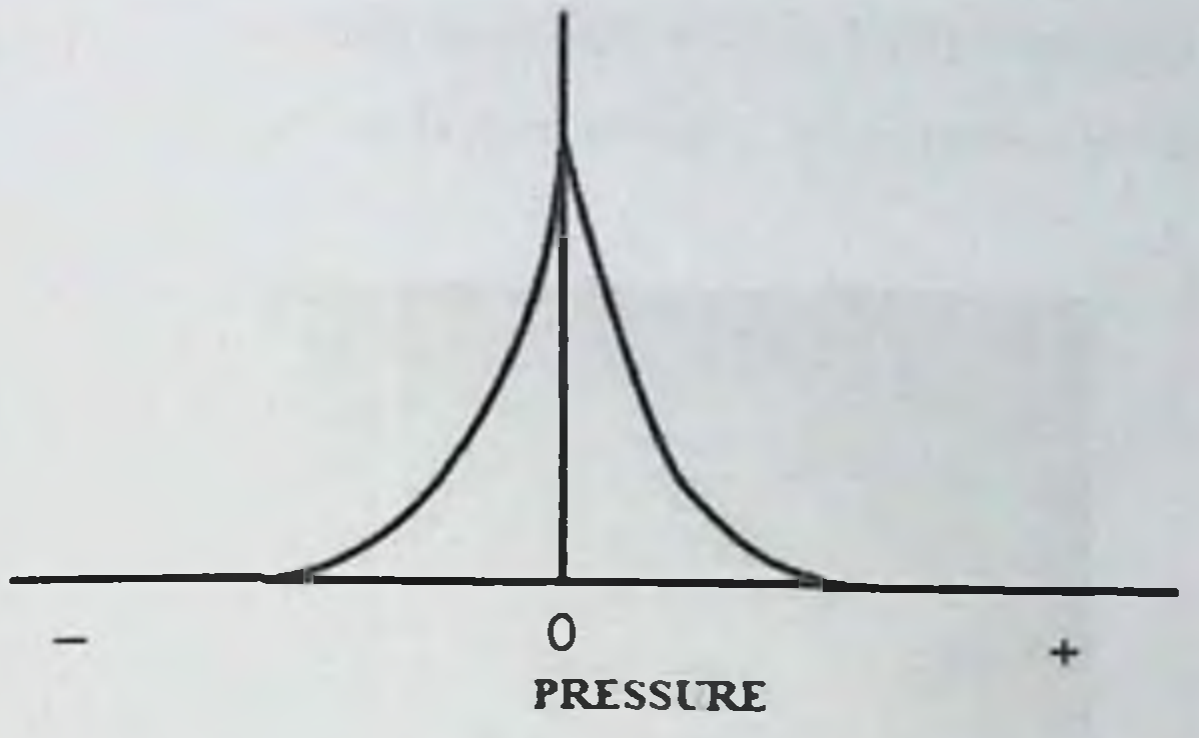
Learning the function of the auditory tube.

Functional study of the middle ear consists in determining the state of the hearing function and the permeability of the auditory tube. Because the role of ventilation (air transmission) of the auditory tube is very large, not only to equalize the pressure in the middle ear cavity, which ensures the normal functioning of the

auditory chain and the eardrum, but also moderate inflammation In order to prevent these processes, it is of great practical importance to study its function. The study of the ventilation function of the auditory tube is based on listening to the sounds of air blowing through the tube and passing through it. For this purpose, we need an otoscope (a rubber tube with an olive at both ends), a rubber balloon with an olive at the end (Politzer balloon) and an ear catheter. When conducting the study, one end of the otoscope is placed on the patient's external auditory canal, and the other end is placed on the doctor. Through the otoscope, the doctor hears the sound of air passing through the auditory tube (Pic.36).

Picture: 36.*Determination of the conductivity of the auditory tube*

A more modern method of assessing the permeability of the auditory tube is tympanometry, which allows to objectify the obtained data (Pic.37). type a - in moderation; type b - dysfunction of the auditory tube.



***Picture:** 37.Tympanometry and tympanograms:*

X-rays of the temporal bones are widely used to diagnose ear diseases. A special method according to Schuller, Mayer and Stanvers is used.

According to Schuller, the structure of the mastoid tumor, the level of pneumatization is evaluated on the X-ray of the neck bones, the characteristic destruction of bone bridges between cells is determined in mastoiditis.

According to Mayer, radiography allows to identify signs of damage to the bony walls of the middle ear by a pathological process, often as a result of the development of cholesteatoma.

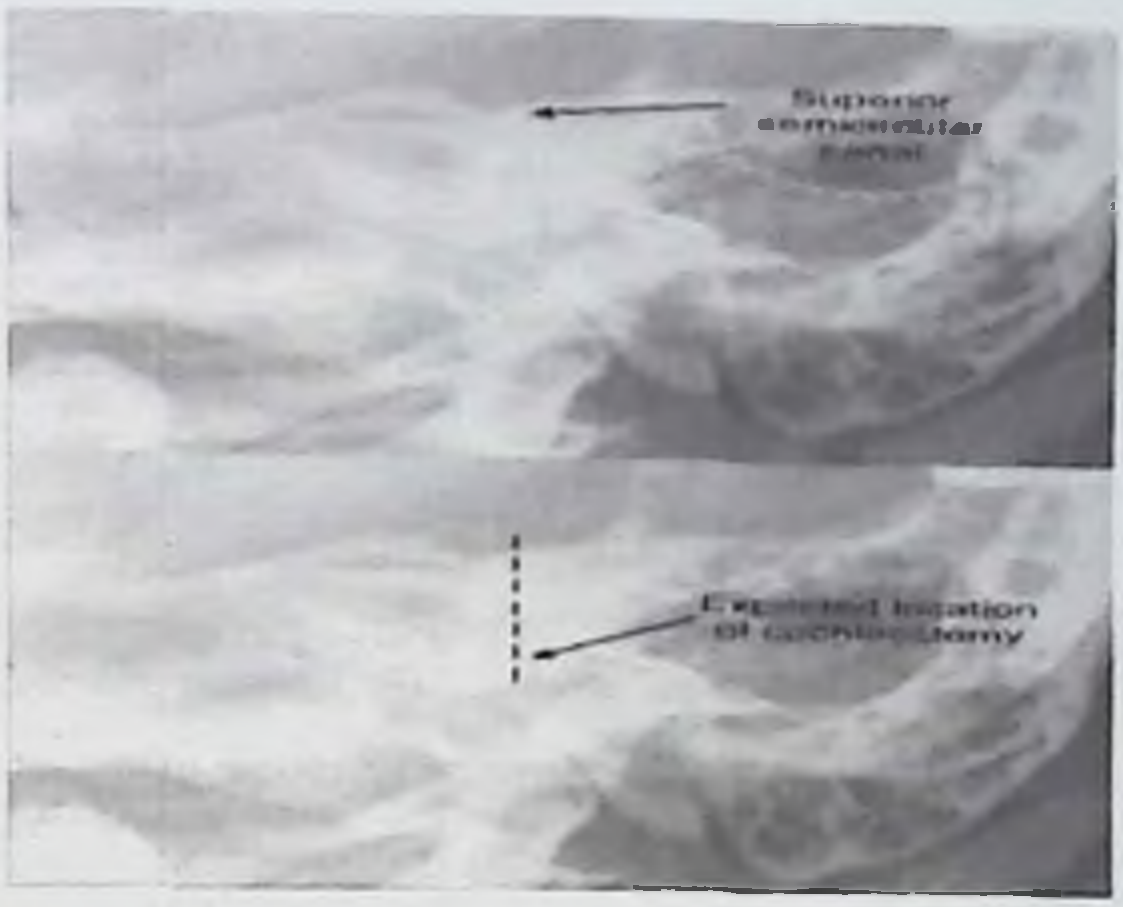
According to Stanvers, the radiograph shows the apex of the pyramid, the labyrinth, and the internal auditory canal. For the diagnosis of neuroma of the

vestibular nerve (VIII pair) or transverse fracture of the pyramid, the position of the internal auditory tube is determined. (Pic. 38).

1.

2.

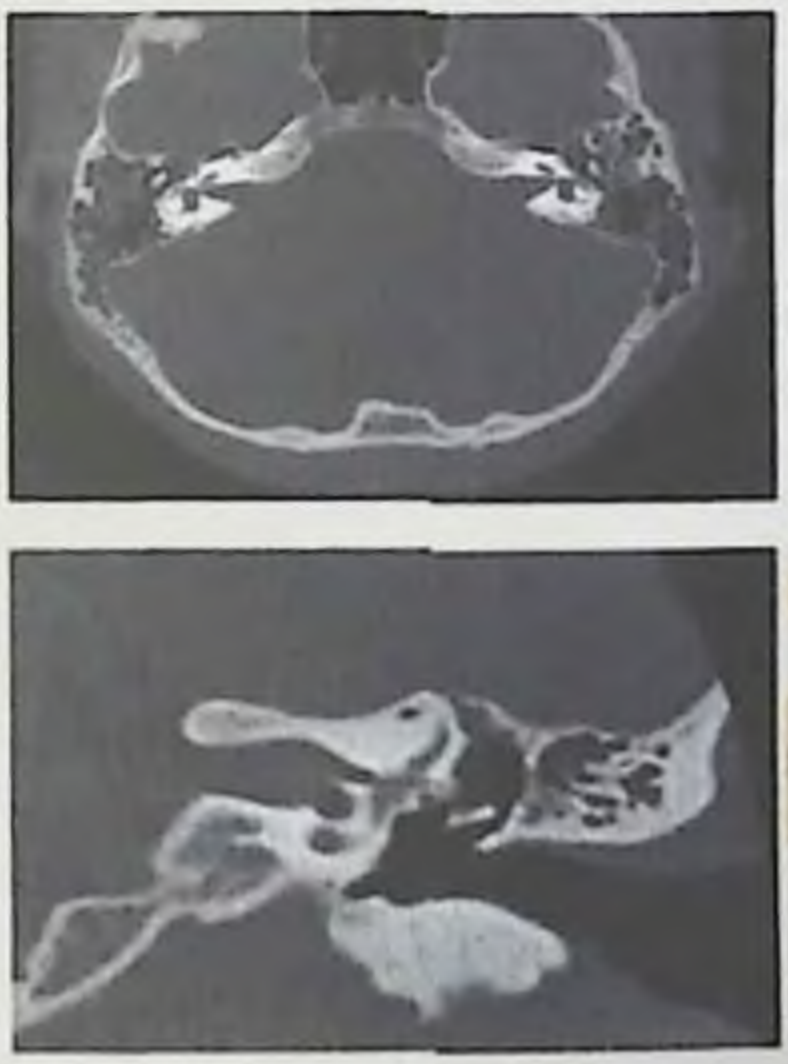
3.



Picture. 38. 1. According to Schuller 2. According to Mayer 3. According to Stanvers

The structures of the temporal bone and ear can be visualized more precisely with CT and MRI.

CT makes it possible to make sections 1-2 mm thick, where bone and soft tissue changes are determined. Cholesteatoma, its size, semicircular canal fistula, hearing bone destruction can be determined. (Pic. 39).



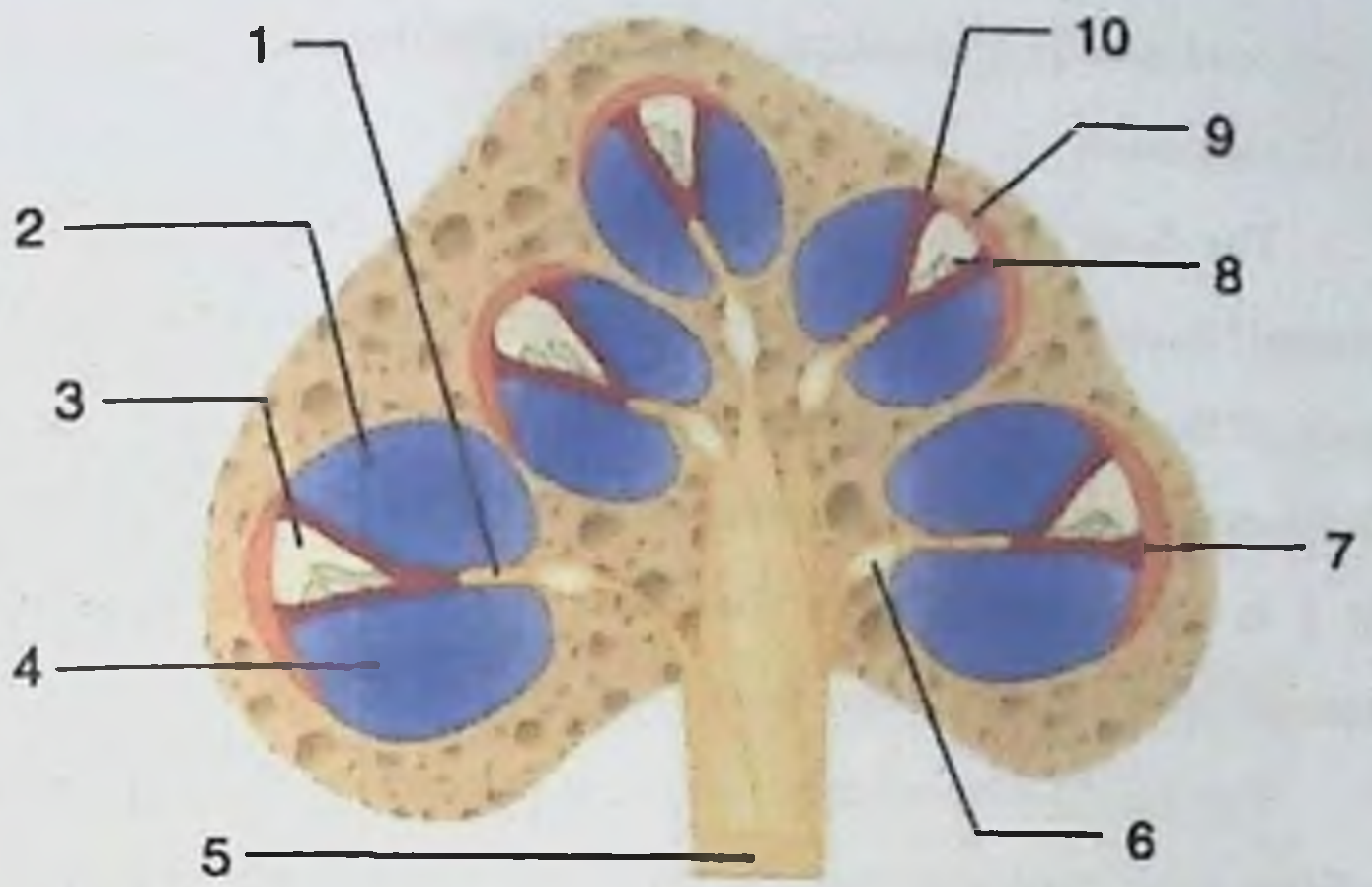
Picture. 39.Computed tomogram of temporal bones is normal (axial and coronal projection): 1 - epitympanum with hammer and sandal; 2 - facial nerve; 3 - Cochlea; 4, 12 - internal auditory canal; 5 - vestibule of the labyrinth and semicircular canal; 6 - sigmoid sinus; 7 - sagittal semicircular canal; 8 - epitympanum; 9 - horizontal semicircular channel; 10 - hammer; 11 - external auditory canal.

MRT has advantages over CT in determining the formation of soft tissues, in the differential diagnosis of inflammatory and tumor changes.

1.6. Methods of testing the function of the hearing analyzer

The peripheral receptors of the auditory analyzer are the spiral organ (Corti's organ) and are represented by the auditory nerve derived from it. The central part of the auditory analyzer is located in the area of the transverse temporal lobe. There are several groups of neuroepithelial cells in the spiral organ: hair cells (outer and inner), as well as outer border and phalange, which not only serve as helpers for hair cells, but also perform a trophic function for these cells. (Pic.40).

It is believed that the inner cells of the hair contribute to the precise localization of sound, and the outer part provides a complex of sound sensations. In addition, the outer cells receive weak sounds, and the inner cells receive strong sounds. In addition, it was noted that the outer cells are very weak and their functions in various pathological conditions of the inner ear are affected much earlier than the inner cells, the patient first notes the disturbance of receiving weak sounds. It should be noted that these hair cells are very sensitive to lack of oxygen.



Picture. 40.Cochlea structure: 1 - spiral plate; 2 – hall staircase; 3 – Cochlea road; 4 – drum ladder; 5 – auditory nerve; 6 – spiral ganglion; 7 - basement membrane; 8 - Cortiev organ; 9 – spiral coil; 10 – atrial membrane

The conversion of mechanical energy into bioenergy takes place in the spiral organ: under the influence of the push of the elongated foot plate attached to the oval window, the movement of perilymph occurs along the ladder of the duct and passes through the helicotreme located on the top of the cochlea to the ladder of the lower drum and secondary the drum continues to the cochlea mirror, which is the membrane. The movement of the perilymph passes through the cochlea and moves the endolymph located inside the membrane labyrinth, and as a result, it causes the basilar membrane to vibrate with the spiral organ. leads to vibration along (from the base of the cochlea to the apex), loud sounds - only in the area of the base of the cochlea, its fibers are shorter and their tension and elasticity are 100 times greater than those of helicotrema.

According to existing theories, sounds of different frequencies can affect only certain parts of the main membrane, which explains the ear's ability to distinguish sound frequencies and break down complex sounds from the outside. Thus, the spiral organ acts as a detector that responds only to certain external sound

energy and acts as a transformer that transfers the audible sound to the process of nerve excitation.

The flow of sound energy into the inner ear is accompanied by both air (external auditory canal, eardrum and chain of auditory bones) and bone tissue (the bones of the skull vibrate under the influence of loud sounds and cause perilymph displacement, due to the compression of the walls of the bony labyrinth of the inner ear) is also done through Therefore, there are two ways to determine the permeability of air and bone tissue.

The sound-transmitting mechanism refers to the functional ability of the auditory tube, eardrum, chain of the auditory bone, labyrinthine glass, and inner ear, as well as the state of tissue conduction (sound travels through the spiral organ).

The mechanism of sound reception is the receptor of the spiral apparatus, the auditory nerve, the center of the central part of the auditory analyzer in the temporal branch of the brain.

The methods of studying hearing acuity are based on determining a person's ability to distinguish sounds of different frequencies delivered to the ear through the external auditory canal and skull bones.

Hearing acuity test

As a result of the effects of diseases on the sound-transmitting and sound-receiving parts of the ear, the perception of individual sounds and pure tones generated by tuning forks or special devices - audiometers is disturbed.

Hearing test with speech

The simplest method of initial research of hearing acuity is to test the person's reception of whispered (spoken) speech. The patient stands at a distance of 6 m from the doctor with the examined ear facing the doctor. So that the patient does not see the movement of the doctor's lips, he is forbidden to look at the doctor's side (Pic. 41).

Picture. 41.Determination of hearing acuity with whispering and conversational speech

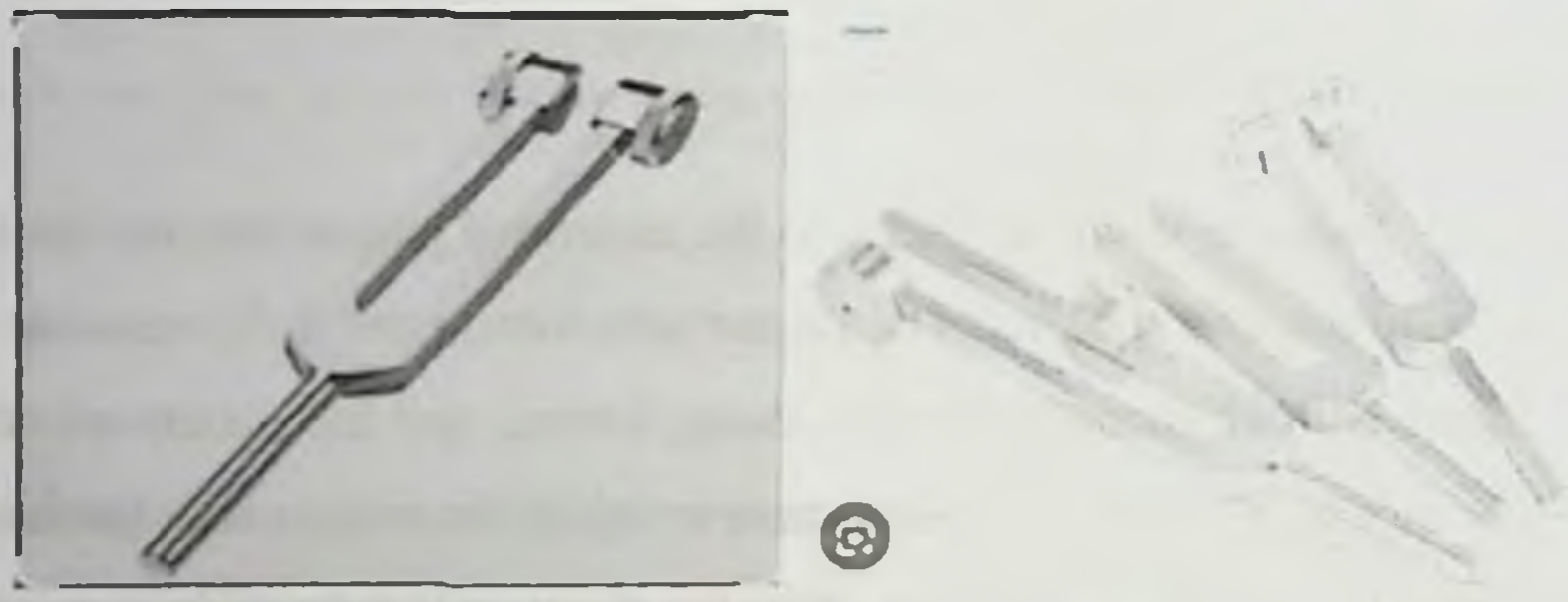
Then the doctor explains to the examined person that he should repeat the words he heard out loud. The doctor asks him to close the opposite ear with his finger and whispers words containing letters, and the patient records the exact distance from which he repeats these words.If the patient does not hear whispered words from a distance of 6 m, then the distance is reduced by 1 m each time and the examination is repeated several times. It is considered that under normal conditions, a person with normal hearing can distinguish a whispered speech at a distance of 6-7 meters.

A similar check is carried out with the help of the words spoken in conversation speech (in normal voice). The test result is determined by the distance at which the patient hears the words (in meters). Normally, a person can hear words spoken in a normal voice from a distance of 20-25 meters. A decrease in these indicators indicates a decrease in hearing ability. If the patient hears whispering

speech in front of the eardrum, and conversational speech from a distance of 4-5 m, then the sound reception apparatus is considered to be damaged; A patient with damage to the auditory center cannot understand the spoken words when he hears them.

Hearing test with tuning forks. This method is an informative method of studying hearing acuity, which allows you to determine hearing ability using tuning forks. Tuning tuning forks were invented by D. Sror 250 years ago and were used in tuning musical instruments and in singing practice. At the end of the last century, tuning forks began to be used to study hearing function. For practical purposes, mainly 128 and 2048 Gs. frequency tuning forks are used. (Pic. 42).

Research with tuning forks allows to evaluate both quantitative and qualitative changes in the auditory analyzer, that is, to diagnose the damage of the sound-conducting or sound-sensing apparatus and determine how much this disorder differs from the norm.



Picture. 42.Camerton

Research with tuning forks is carried out in a certain sequence shown in the diagram. Several experiments were conducted with a tuning fork (128 Gs).

Weber's experience(Pic. 43) - "lateralization" of the sound in one or the other ear along the bone is determined. The foot of the C128 sound tuning fork is placed on the top of the patient's head and asked which ear (healthy or diseased) receives the sound of the tuning fork louder. If the patient states that the sound of the tuning fork is received louder by the diseased ear, then this indicates that the

sound-conducting part of the ear is damaged, if the healthy ear hears well, the sound reception indicates that the section is broken.Usually, "lateralization" does not occur, and a person receives the sound of a tuning fork placed on top of his head equally with both ears; he hears a voice above his head.

a b v

Picture: 43.Weber's experience: a - no lateralization; b - lateralization to a healthy ear; v - lateralization in the diseased ear

Rinne's experiment (Pic. 44) is a comparison of the duration of reception of C128 tuning fork sound through air (the examiner holds the tuning fork in front of the auricle) and bone (in this case, the tuning fork is placed on the mastoid process). A stopwatch measures the time it takes for a tuning fork sound to be received, delivered to the external auditory canal, and deposited in the mastoid.

Picture:44.Rinne's experiment

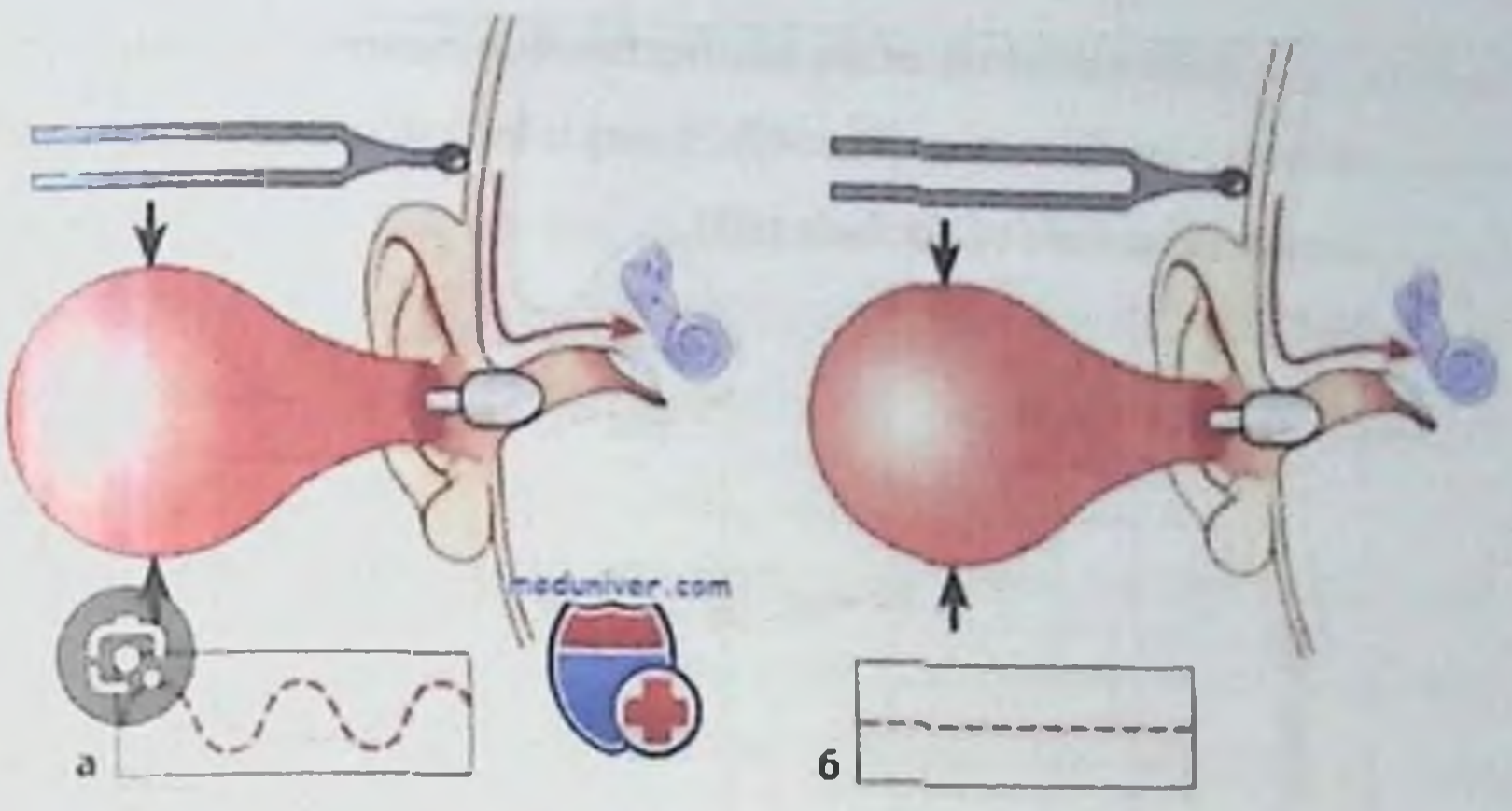
Normally, air permeability should be about 2 times greater than bone permeability. In such cases, Renne's experience is said to be "positive". If there is

a violation in any part of the sound-conducting apparatus, the Rinne test is "negative", that is, air conduction may be shorter than or equal to bone conduction.

Schwabach's experiment - (Pic. 45) is a study of the state of the sound reception apparatus. First, the doctor places the C128 tuning fork on the patient's forehead or nipple and asks them to say when they stop receiving the tuning fork sound. After that, the doctor moves the leg of the tuning fork to his forehead or mastoid, if the sound is heard, then the patient has reduced bone conduction, which means that the sound receiving apparatus of the ear is disturbed. .

Picture: 45. *Schwabachexperience*

Jelle's experience - (Pic. 46) is based on the diagnosis of fibula strength in the hall mirror in the case of otosclerosis. The same C128 tuning fork is attached to the patient's nipple and closes the external auditory canal with the index finger, creating an increase and decrease in air pressure in it; For this purpose, you can use an ear balloon. The patient is asked how he perceives the sound of the tuning fork - periodic or continuous. If the sound is intermittent, then there is no fixation of the stirrup, then Jelle's experience is positive. When fixing the extension in the hall window, the sound of the tuning fork is considered constant, and Jelle's experience is considered negative.

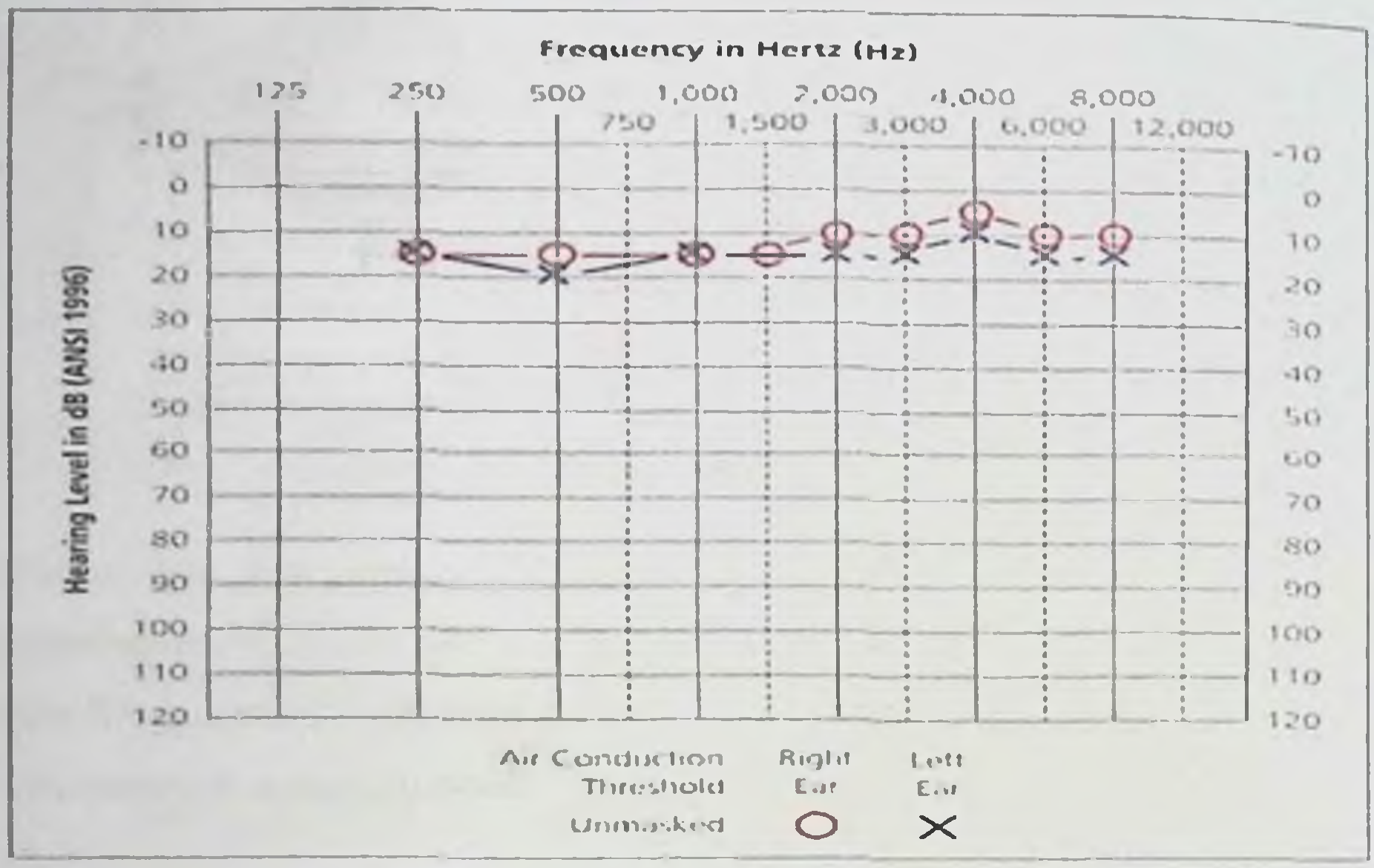


Picture: 46. Jelle experience

By examining the hearing using the C2048 tuning fork, they record the time of receiving sound through the air and evaluate the ability to distinguish loud sounds, that is, the condition of the receptor apparatus is evaluated. All information is included in a special table, which clearly shows the doctor the nature and degree of hearing impairment.

Audiometry

A detailed study of the hearing function is carried out using special electronic devices - audiometers (Pic. 47). Using electroacoustic devices, sound power is measured in units of decibels (dB).



Picture. 47.Audiometry

It is known that the human hearing range includes frequencies from 16 to 20,000 Hz.Hearing tests should be conducted in a special soundproof chamber. Audiometry allows obtaining characteristic curves, audiograms, typical for damage to the sound-conducting system of the ear, its sound-sensing part or joint damage. Threshold and high-threshold tone audiometry are different.

Tonal threshold audiometry is performed in order to determine the thresholds for receiving sounds of different frequencies in air and bone conduction. With the help of air and bone phones, the sensitivity of the hearing organ to the level of perception of sounds of different frequencies is determined. The results of the research are entered into a special box called "audiogram". An audiogram serves as a graphic representation of threshold hearing.

Using a standard clinical audiometer, the hearing threshold is checked in the range of sound waves from 125 to 8000 Hz.For both air conduction and bone

conduction, the normal hearing thresholds for sounds at all frequencies are defined by the zero line. Thus, the tonal threshold audiogram allows you to determine hearing acuity first of all. According to the nature of the boundary curve of air and bone conduction, a qualitative characteristic of the patient's hearing can be obtained, that is, the presence of sound conduction disorders, sound perception or mixed (combined) damage is determined.

Tone threshold audiometry allows you to determine damage to the sound-transmitting or sound-receiving apparatus in its most general form, without more precise localization. Determining the form of hearing loss is carried out using additional - above-threshold and speech audiometry methods.

Tonal suprathreshold audiometry is designed to detect the phenomenon of pitch acceleration. The presence of this phenomenon indicates cell damage to the receptors of the spiral organ. Speech audiometry, unlike tone, allows you to determine the social readiness of hearing. The method is especially valuable in the diagnosis of central hearing damage (Pic.48).

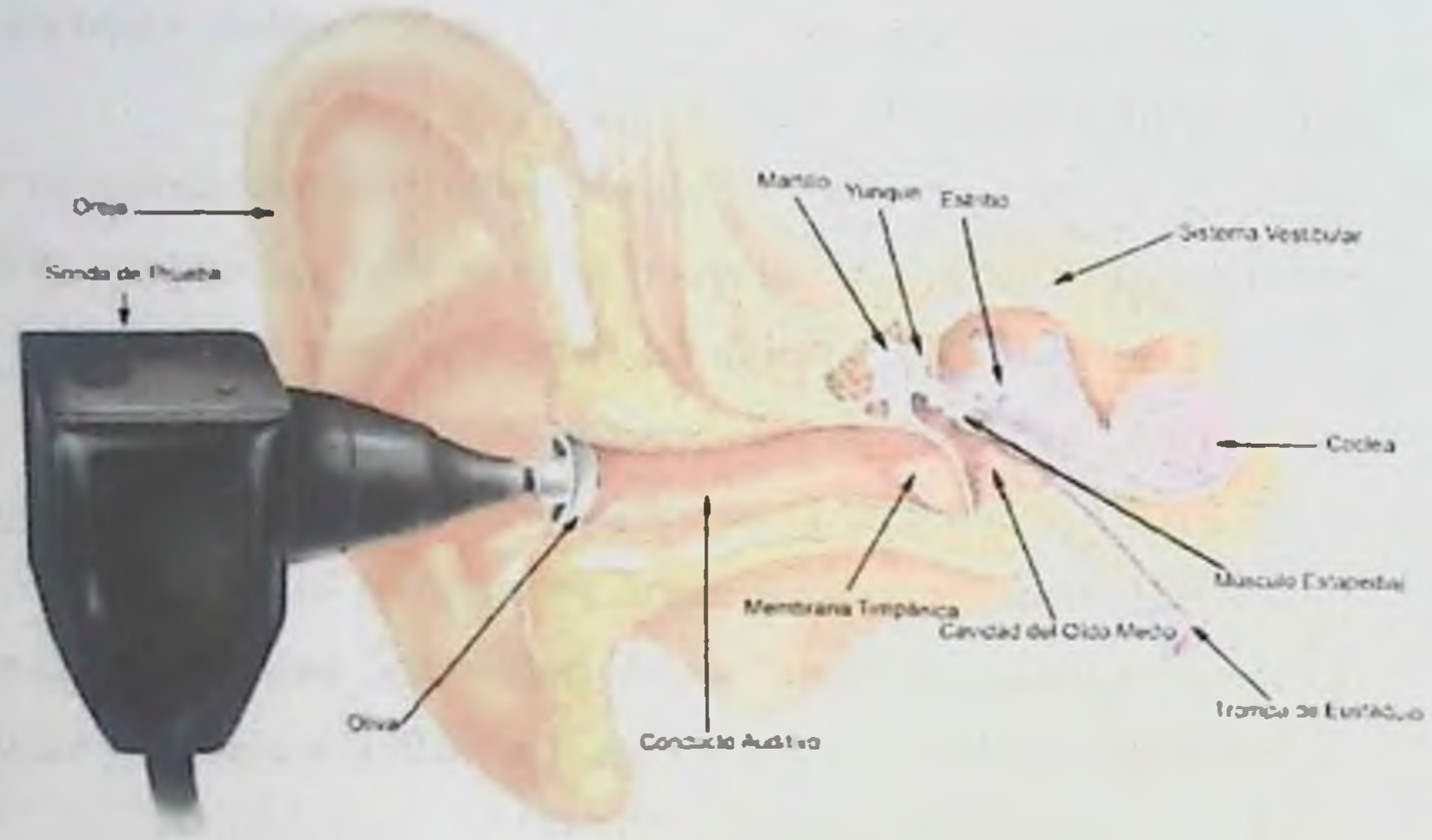
Picture. 48.Speech audiometry

Objective audiometry.

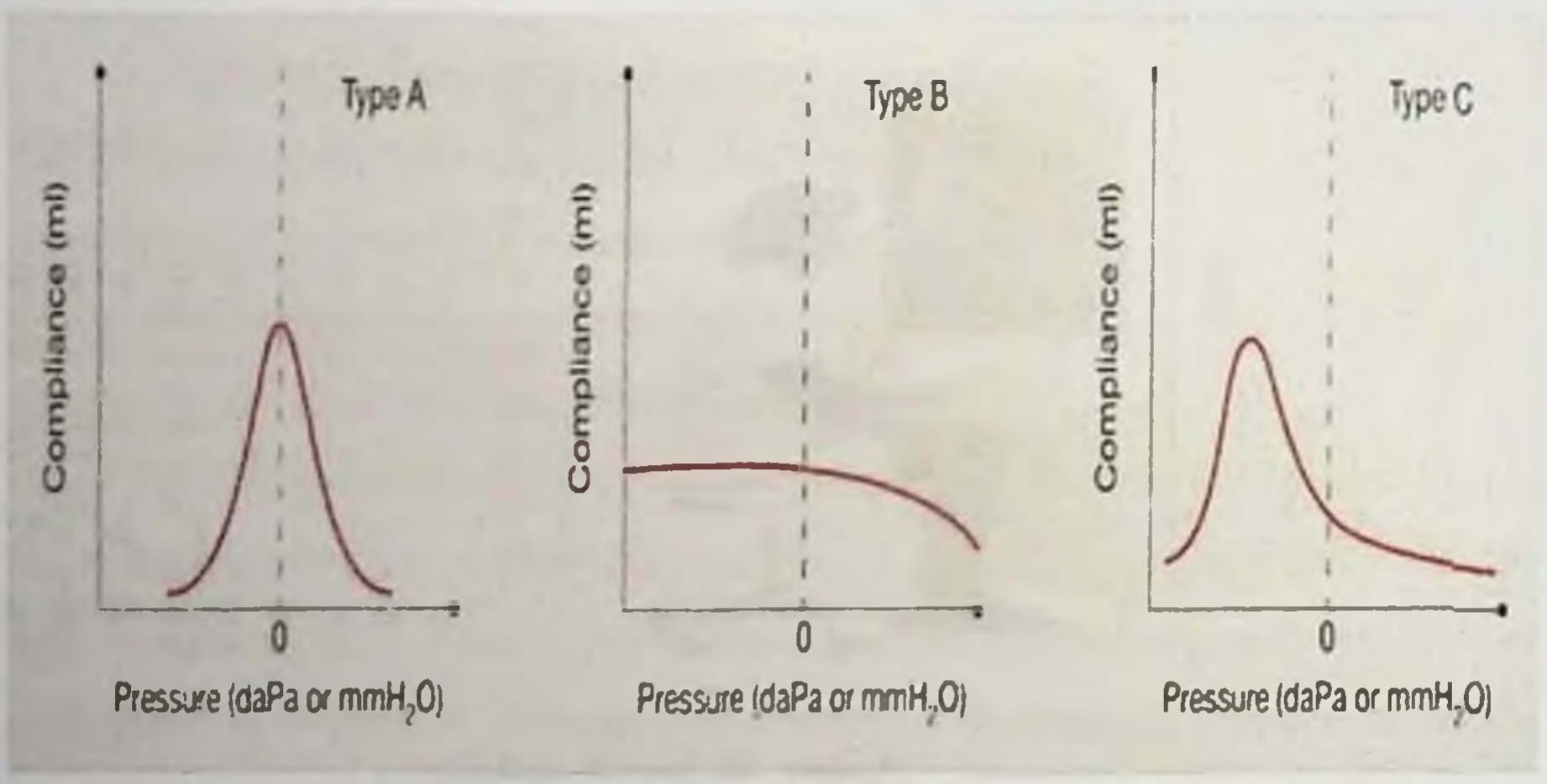
Impedance audiometry. This is one of the objective assessment methods of hearing based on measuring the acoustic impedance of the sound-conducting

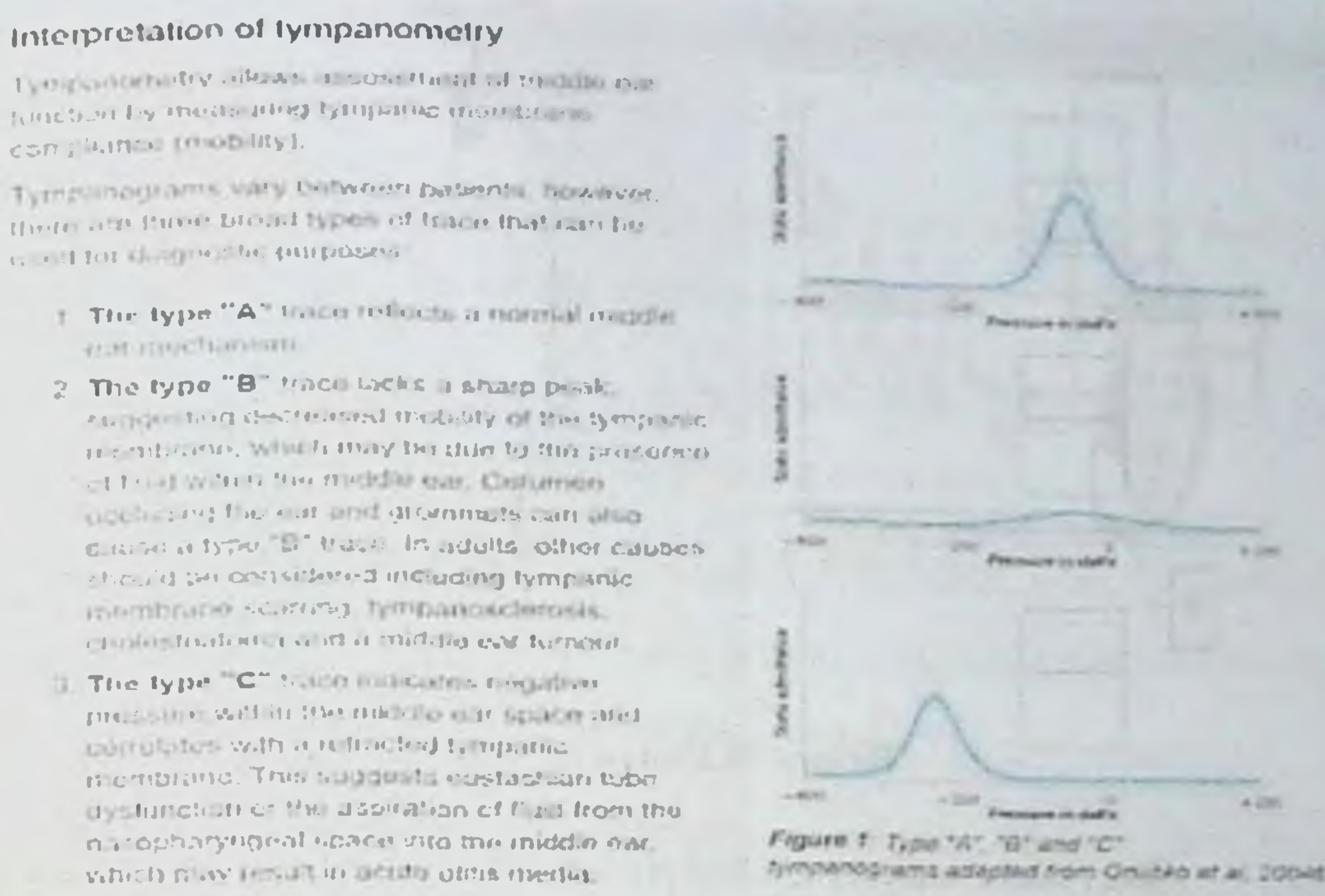
device. (Two types of impedance audiometry are used in clinical practice: - tympanometry - acoustic reflexometry.

Evaluation of tympanometry is based on its types (Pic. 49).



Impedanceometry





Picture. 49- Types of tympanogram: type A - norm: type B.C – exudate in the drum cavity

Objective methods of hearing research are based on the registration of auditory evoked potentials. The method is based on the registration of the potentials in the cerebral hemispheres with sound signals in the electroencephalogram (Pic.50).

The time of occurrence of evoked auditory potentials is of different class depending on the location of the generatorsdivided into: short-latent evoked auditory potentials, which include cochlear and auditory nerve fiber potentials (electrocochleography) and potentials of brain stem structures - short-latent, medium-latent and long-latent evoked auditory potentials.

Picture.50.*Evoked potentials of hearing*

Short latent auditory evoked potentials (SLAEP) are widely used, they allow to get an idea of the electrical activity of the auditory nerve fiber and brainstem structures within 1 to 15 ms. SLAEP consists of a complex of positive peaks, which are designated by Roman numerals according to the order of their appearance (I-VII waves). Nowadays, all scientists hear the G wave of the short latent auditory potential (SLAEP) they agree that it arises from the nerve fiber. A number of authors support the opinion that the 2nd peak originates at the far level of the cochlear, 3 - the superior olive complex, 4, 5 - the lateral hook and the lower peaks of the four peaks, 6, 7 - the level of the internal geniculate body.

As a rule, SLAEP can be recorded in all examined persons. Usually the recording threshold corresponds to hearing in tone threshold audiometry, or is slightly higher. In conductive hearing loss, there is an increase in the latent period of all components of SLAEP, in which the intervals between the peaks do not change.

In cases where the pathological process is located in the area of the inner ear, SLAEP is more clearly noted, in which the 1st peak may be lost. The relationship between SLAEP and hearing loss parameters is determined by the shape of the audiometric curve, the degree of hearing loss, and parameters of acoustic stimulation. At high levels of stimulation, potential amplitude and latency

correspond to normal.A tendency to shorten the distance between the potentials of peaks 1-5 can be observed.

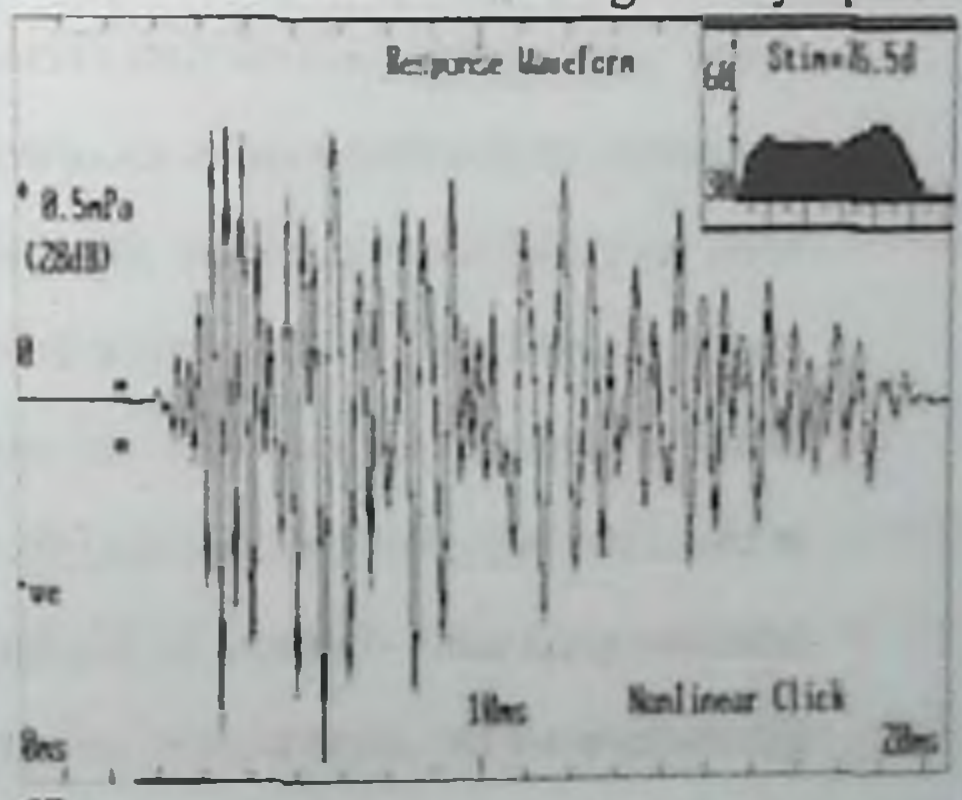
In norm and in cochlea pathology, the difference between the peaks in the intervals between I-V peaks should not exceed 0.3 ms.

SLAEP is recorded even in babies. Its advantage is that in practice it does not depend on the vigilance of the person being examined.

Medium-latent evoked auditory potentials (MLAEP) occur within 10-50 ms and reflect both neural and neuromuscular activity. Potential generators involve the medial geniculate body and primary auditory cortex.

Long-latency (LLAEP) are recorded in equal time intervals from 50 to 400 ms, and are often determined by the activity of the auditory cortex. CHEP recording is a bright examination method with a bright future in audiological diagnostics, which is being further improved and filled with new possibilities during scientific study and practical application.

Otoacousticemission recording. Otoacoustic emission (OAE) is a sound response that occurs in spiral organelles, particularly in outer hair cells that have the ability to change their length due to their actin-myosin substance.is the result of micromechanical processes. The active movements of the outer hair cells, enhanced by the positive feedback loop, cause traveling waves that pass to the basilar membrane and are directed in the opposite direction, reaching the base of the tendon and oscillating the tympanic



membrane. These vibrations are ultimately recorded by a highly sensitive microphone inserted into the external auditory canal of the normally functioning ear. It is important that the OAE recording test should be performed in a quiet, noise-free room. When recording OAE, it is necessary to send signals with moderate power so that sound waves with a much lower power can be distinguished from the noise background in the external auditory canal. Different amounts of average forces and their computer processing can be used to record even the smallest response in the recording field. A distinction is made between spontaneous and evoked OAEs.(Pic. 51).

Picture.51 *Otoacoustic emission*

Spontaneous otoacoustic emission (SOAE) is recorded in individuals with 30-40% normal hearing without sound stimulation. A neurosensory ear weight of more than 30 dB reduces spontaneous otoacoustic emissions by 8-15%.

Evoked otoacoustic emissions (EOE) are recorded in response to sound stimulation. Delayed Otoacoustic Emission (DOAE) by the nature of the sent stimulus, in which a wide-pitched clap sound is used as a stimulus, and otoacoustic emission in the disturbance frequency, in which two tones of different frequencies Fl and F2 are sent simultaneously as a stimulus.. Both classes of OAE called in the norm are noted in 100% of cases.

The preservation of inner ear structures in sensorineural hearing loss has a significant impact on OAE indicators. For example, in sensorineural hearing loss, the response amplitude of both classes of OAE is significantly reduced compared to the norm, or the response is recorded under damage to the inner ear. In this case, a high level of hearing loss in the tone-threshold audiogram corresponds to a much lower amplitude of the atoacustic response. In cases where the process is retrocochlear, for example, in neurinoma of the VIII th nerve fiber, the OAE called at the initial stage of the process is recorded and it is normal. Prolonged hearing loss leads to secondary damage to the sensory structures of the inner ear involved in the generation of the otoacoustic response. Therefore, in the retrocochlear processthe

duration of the pathological process, and not the degree of ear severity, affects the acoustic response index.

Thus, the available hearing testing methods allow to get information about the level and form of hearing loss, which part of the hearing analyzer is damaged.

1.7. Methods of checking the functionality of the vestibular analyzer

Starting with simple methods, it is constantly necessary to examine patients suspected of disease of the vestibular apparatus in the inner ear.

Complaints characteristic of labyrinth injuries (dizziness, nausea, vomiting, unsteadiness of walking) are identified in the targeted survey. These complaints emphasize the connection of the vestibular analyzer of the inner ear with the brain, autonomic centers and skeletal muscles.

Diagnosis of spontaneous nystagmus. Nystagmus is an involuntary, rhythmic oscillation of the eyeballs in one or another plane (horizontal, vertical, frontal - in this case, the eyeballs "semi-rotate" around the sagittal axes).

Vestibular nystagmusconsists of two - slow and fast components. To detect vestibular nystagmus, the doctor asks the patient to look at any object or finger that should be 30 cm away from the plane of the patient's face, moving the finger from the center of the face to the right or left side, Attention is paid to the vibration of the apples. The direction of the nystagmus is determined by its fast component, that is, the nystagmus is to the right - the fast component is directed to the right. If the nystagmus occurs only according to the fast component, then it is a nystagmus of the I degree. If the nystagmus continues to move forward, then it is grade II nystagmus, and finally, if the nystagmus continues toward the slow component, then it is called grade III nystagmus. The fast component of the nystagmus refers to the labyrinthine aspect that "provides an overactive feature."

Pointing tests (finger-nose, finger-toe). By testing the fingers, the patient is asked to open his hands on both sides, close his eyes, and then touch the tip of the nose with the index finger of his right and left hand. In cases where one of the labyrinths is characterized by overexposure, a two-handed shift to the slow

component of the nystagmus is observed, that is, it shifts to the side of the healthy ear. In cases where the pathological process is located in the area of the posterior cranial fossa, making a mistake during this test corresponds to the side of damage with only one hand.

With a finger-to-finger examination, the patient sitting in front of the doctor closes his eyes, touches both index fingers, raises his hands from the knee, and touches the doctor's index fingers 40-50 cm above the patient's knee. will be The distance between the doctor's index fingers is about 20 cm. organizes. In cases where the right labyrinth is overactive, the patient is pushed with both hands towards the left ear (that is, towards the slow component of the nystagmus). If the posterior fossa is affected, the fault is with only one hand on the affected side.

Adiadochokinesisdiagnosis. The patient is asked to close his eyes, reach forward as quickly as possible to quickly change the pronation and supination of the arms. If the auditory labyrinth is affected, adiadochokinesis is not detected, that is, both hands perform the same speed and amplitude of movement. When the posterior cranial fossa is damaged, adiadochokinesis is manifested as follows: - the hand on the affected side makes slow, sometimes irregular, "sticky" movements.

Thus, simple research methods can now not only show damage to the labyrinth, but also make a differential diagnosis between damage to the labyrinth and disorders of the posterior cranial cavity (arachnoiditis, brain abscess).

Walk check. As noted, among the characteristic complaints that can be heard from patients with diseases of the vestibular apparatus, gait disorders are also identified. To check this, the patient is asked to walk in a straight direction at a distance of 6 meters with his eyes closed. Turns to the left, looking at the slow component of the nystagmus, and the fast component directed to the right, indicates that the labyrinth of the right ear is overexcited. Step-by-step walking, i.e. putting one foot on the other, the patient's movement to the right and left with closed eyes is checked. With vestibular disease, this type of walking is not disturbed and is difficult or impossible to do when moving towards the lesion with damage to the posterior cranial fossa.

Standing in the Romberg pose. The patient is asked to stand up, put his legs together, stretch his arms and close his eyes. For example, if the right labyrinth is affected, the patient's body is turned towards the healthy ear. When the position of the head changes, the direction of the patient's fall also changes. When the posterior cranial fossa is damaged, the direction of descent does not depend on the position of the head (turned to the right or to the left).

Calorie test- based on the physical property of liquid molecules to decrease when cold and increase when heated. In the semicircular canals, cooled or heated water is poured into the external auditory canal to cause endolymph molecules to flow into or away from the ampulla. The degree of overexposure of the auditory labyrinth is determined by comparison with the duration of nystagmus, its level, the amplitude of eyeball movements, as well as the strength of autonomic reactions (sweating, nausea, paleness, etc.) with indicators and comparing these indicators with the calorization of the right and left ear. Depending on the position of the patient's head (bent forward, over the shoulder, thrown back), front (front), sagittal (back) or horizontal (lateral) semicircular canal may appear. In practice, calorization of the lateral semicircular canals is mainly used, for which the head of the patient sitting in a chair is thrown back, then the ampoules of these canals occupy the upper position. In such cases, the optimal conditions for the displacement of endolymph from the ampoule (from cold water) or from the ampoule (from warm water) occur. Usually, after the introduction of 100 ml of cold liquid at a temperature of 20 ° C along the back wall of the external auditory canal, horizontal nystagmus occurs for 20 seconds. appears, its fast component is directed towards the opposite ear (outflow of endolymph from the tip of the ampoules) 60-70s.

Deviations from these data indicate a disorder or overstimulation of the studied labyrinth.

Don't try to rotate. Like calorixinama, this study determines the extinction or exposure characteristic of the auditory labyrinth. The examination is also based on the rules presented on the basis of Ewald's experiment: the displacement of

endolymph to the tip of the ampullae causes nystagmus (fast component) towards the ampulla that gives the effect, while the displacement of endolymph from the tip of the ampullae is accompanied by nystagmus in the opposite direction. A Barani chair is used to perform a rotating test (Pic. 52). Turning the patient clockwise - 10 rotations for 20 seconds, the chair is suddenly stopped, and the resulting nystagmus, the degree of deviation of the head and body is observed. During rotation, his head should be turned 30 ° forward, then the lateral semicircular canals will be in the plane of rotation, the patient's eyes should be closed. Usually, the duration of "post-rotation nystagmus" is about 20 seconds. After 5 minutes, a counterclockwise rotation is performed and the determined reaction of the labyrinth is compared with both sides.

Picture. 52.Barani Chair

Fistula test. Pressing a finger on the studied earlobe and at the same time, an increase in pressure in the drum cavity, nystagmus, and a feeling of dizziness are noted. Nystagmus with a positive fistula test is directed in the opposite direction to the studied ear when the pressure in the auditory canal of the drum cavity increases and the air is rare, the pressure in these cavities decreases. The presence of a fistular cyst indicates erosion of the bony labyrinth wall.

II. Ear diseases

2.1 External ear diseases.

Congenital anomalies of the external ear. In our country, there is one child per 10.000 children with developmental anomalies of the outer and middle ear per year. (Picure 53). Otorhinolaryngologists and dentists deal with plastic reconstruction of the auricle. However, otolaryngologists now have to perform operations that improve hearing in this group of patients. Restoring the complex relief of the auricle is the most difficult part of plastic surgery.

There are several levels of development anomalies of the auricle: macrotia (enlargement), microtia (there are separate parts - ear soft, fold part in the form of a skin fold), anotia (complete absence of the auricle), no external hearing. includes atresia (complete absence of the external auditory canal).

In both cases, they resort to a custom-made mold to shape the auricle using a framework made of plastic and leather. Ear anomalies are often combined with malformations of other organs, kidney failure, phimosis, hypomastia, congenital heart disease. Also, malformations are observed in the jaws, masticatory muscles, salivary glands, cleft lip and palate.

In addition to surgical interventions to restore the auricle and external auditory canal, reconstructive interventions in the middle ear are used to improve hearing function.

Picture. 53.*Abnormalities of the external ear*

Inflammatory diseases of the external ear.

Otitis externa (otitis externa diffusa) -external auditory canalof the skindiffuse suppurationinflammation (Pic. 2.2). Inflammation - consists of diffuse and limited forms. Ear pain, itching and hearing loss are common for diffuse inflammation. External diffusion-external hearing is deadoccurs as a result of trauma to the skin, for example, often during ear cleaning against the background of diabetes. Currently, the microbial picture in otitis externa has changed significantly. If 25-30 years ago golden staphylococcal pathogenic flora was present, now gray intestinal bacillus, proteins are more often detected. Such shifts in the microbiology of external otitis are explained by the widespread use of various antibiotics in medical practice that suppress the coccal flora and allow microorganisms that are not sensitive to them to dominate.

Picture. 54.Otitis externa

External auditory canalfurunculi (chicken).A limited form of otitis externa -external auditory canalIt is considered a furuncle that appeared in the ear (otitis externa circumscripta).Infection (most often staphylococcal) enters the hair and gland sac when cleaning the ears with a pin or finger. Wind, metabolic disorders, poor nutrition, vitamin deficiency contribute to the development of external auditory canal. In addition, the disease can be observed in general furunculosis.

Clinic: Furuncle is characterized by ear pain,severe pain spreads to the eyes, neck, sometimes all over the head,increases when the auricle is pressed. If boilof the external auditory canallocated on the front wall, during chewing movements, as well as due to the displacement of this wall bordered by the temporomandibular joint, there is an increase in pain. Regional lymph nodes in front of the ankle and behind the ear become enlarged and painful. A strong inflammatory process can spread to the preauricular gland through the inner recesses of the ear canal on the lower wall.

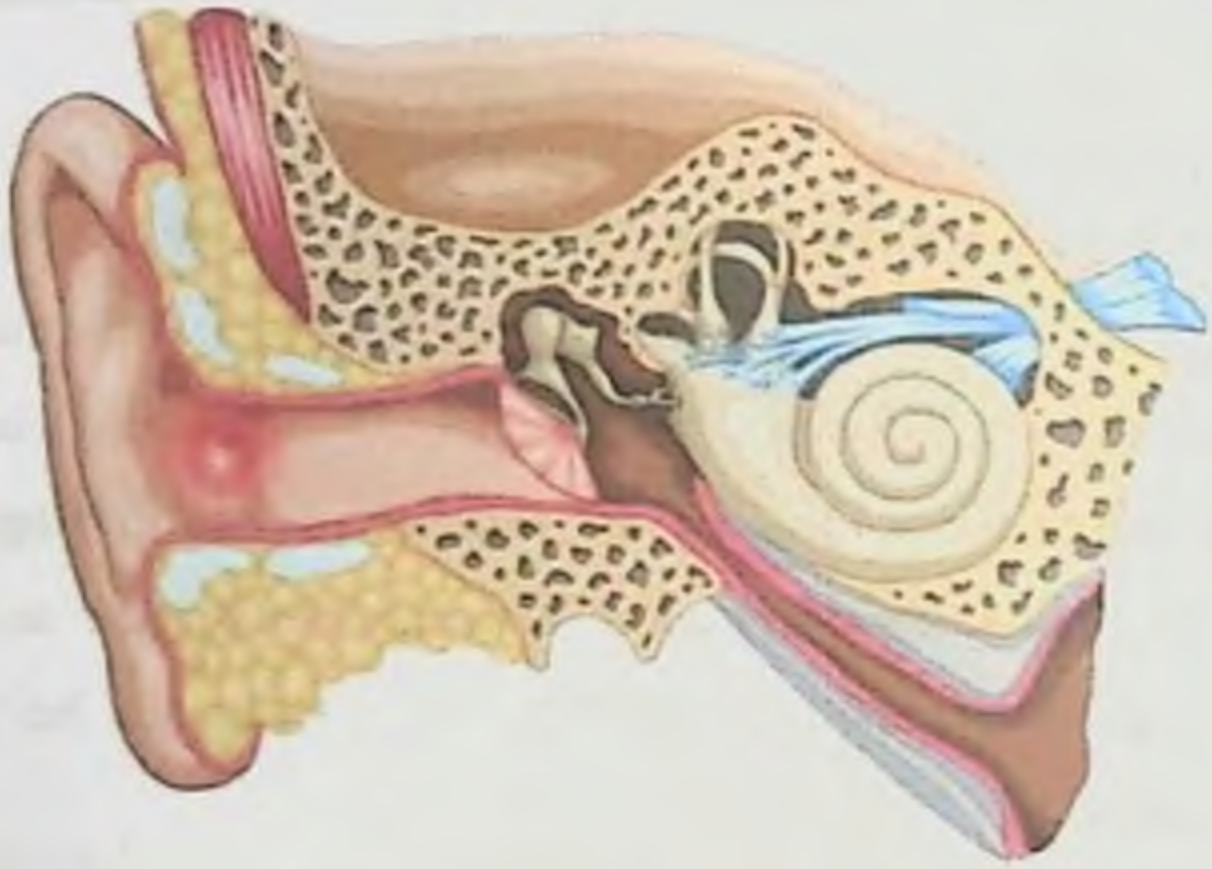
External auditory canalfuruncle of the skinpain, swelling,secretion,of the external auditory canalleads to narrowing (Pic.55).

Otoscopy revealed an inflamed and red circular infiltrate in the external auditory canal and a narrowing of the fissure of the external auditory canal.

Sometimes several chips appear. Due to pain and swelling, it is impossible to insert an earplug into the external auditory canal. The tympanic membrane and the patient's hearing are not affected. Sometimes the inflammatory process can spread to the soft tissues around the auricle, the mastoid area, or the parotid gland. Local lymph nodes are enlarged, painful when palpated.

The patient's body temperature rises. Once the ear canal has matured, it often opens up on its own. Then the pain will decrease a little, and the patient's condition will improve. The illness usually lasts 7 days, sometimes relapses can be observed.

Blood and urine sugar levels are checked to rule out diabetes.



Picture. 55.*Furuncle of the external auditory canal*

Treatment. Penicillin to the patient in the first days of the diseaseand cephalosporins, sent between the muscles. A cotton swab soaked in an alcoholic solution of boric acid or bactroban is inserted into the external auditory canal, prescribed from the group of ointments (yellow mercury oxide 3%, levomekol, synthomycin 2%). Levomycetin, polymyxin M are used when gray bacillus is detected in pus.The patient is given antipyretic and analgesic drugs - aspirin, paracetamol. If necessary, staphylococcal anatoxin, drugs are recommended. autohemotherapy is carried out (7-10 ml of blood is taken from a vein and injected into the muscle every 48 hours). A total of 2-3 procedures are performed.

Additional desensitizing, general strengthening drugs are given. Physiotherapy -external auditory canal UBI, UHF-therapy through the skin. Severe long-term pain is observed in the furuncle, in some cases, the furuncle may open on its own for a long time, or it is recommended to open the furuncle as soon as an abscess is formed.

Eczema of the outer ear (eczema) can develop when purulent discharge, iodine preparations, coal and cement dust affect the skin of the upper ear, when the patient's sensitivity to certain substances increases, or during general diseases. Exudative diathesis, rickets, tuberculosis, weakening of local immunity contribute to the development of eczema.

The disease is acute and chronic. There are open eczema in children, dry and open eczema in adults. In acute eczema, the auricle becomes red and thickens. The auditory canal narrows sharply. Small perichondritis serous blisters, yellow-gray crusts form on the skin, serous exudate flows from the ear, the patient's ear itches. Limited or diffuse otitis externa may develop when a secondary infection is added. In concomitant diseases, eczema is chronic and often recurs.

Treatment measures begin with the treatment of the main disease. The auricle is cleaned with ether or alcohol. In wet eczema, oxycort aerosol, oxycort, hyoxisone, prednisolone ointments are applied. Peels are removed after softening with petroleum jelly. UBI, UHF and ultrasound treatments are prescribed to the patient.

In order to prevent eczema, it is recommended to eliminate all factors that cause dermatitis, to keep clean for patients with acute and chronic otitis.

Episipelascan develop as a primary or secondary disease. The disease is caused by hemolytic streptococcus. Otitis media may develop when the process spreads to the eardrum.

The auricle is reddened, swollen (the swelling also spreads to the eardrum), and it hurts when palpated. Serous blisters are formed in the bullous form of seromas. The damaged area is clearly distinguished from healthy skin. The patient's

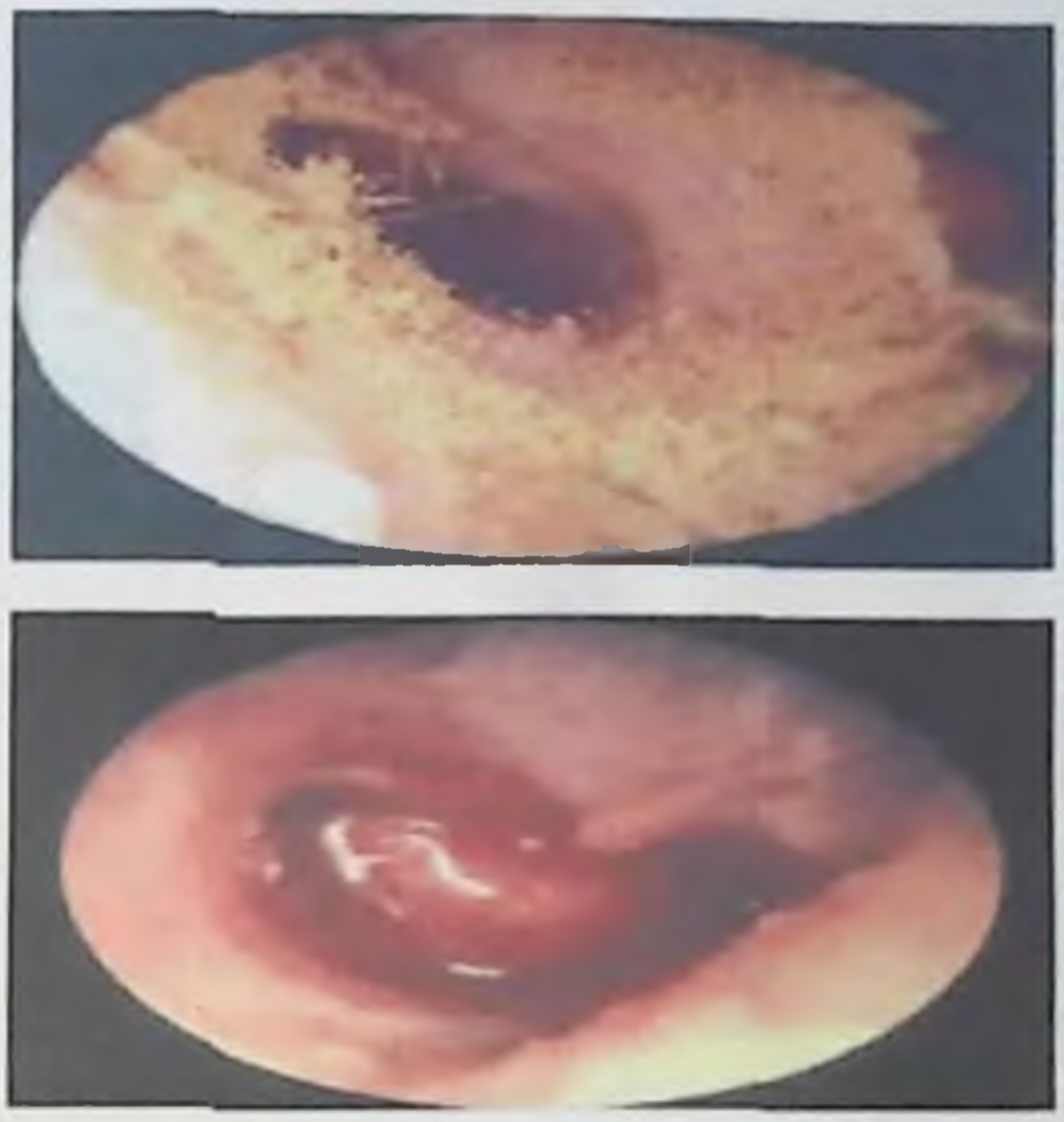
body temperature increases (39-40C). The disease lasts 3-4 days, sometimes it recurs. The process can spread to the mastoid area.

Treatment. In the treatment of Saramas, the patient is given streptocide, etazol or sulfadimezin 3-4 g every 4 hours, levomycetin 0.5 g 4 times; tetracycline 100000-200000 TB 5-6 times, oletetrin 100000-150000 TB 4-5 times; Penicillin 300000-500000 TB is prescribed intramuscularly 4-5 times. UBN treatment (in the amount of erythema) and application of ointments (Vishnevsky ointment, ikhtiol) to the skin of the ear are recommended.

Otomycosis(otomycosis) is a fungal disease of the external ear and postoperative cavities (Pic.56).

Diagnosis of otomycosis- determined on the basis of characteristic complaints, data from the otoscopic image and the results of microscopic examination of the pathological discharge from the ear.

Treatment. Depending on the type of fungal infection found in the discharge from the ear: mold (aspergill) and yeast (candida) treatment is selected. If a fungus is found, chloronitrophenol (nitrofungin), terbinafine (lamizil) (medically, it is placed in the external auditory tube in a moistened form); if yeast is detected - chloronitrophenol (nitrofungin), clotrimazole should be used. Of the drugs prescribed orally, fluconazole (Diflucan), itraconazole (Orungal), ketoconazole (Nizoral) are recommended. Before starting the treatment of fungal diseases, it is



Picture. 56.Otomycosis

necessary to cancel antibiotics, carry out general strengthening treatment, and prescribe vitamins of group B and C. Considering the possibility of allergy, it is necessary to hyposensitize.

Perichondritis of the auricle. Perichondritis of the auricle is a limited or diffuse inflammation of the perichondrium (tympanic membrane) of the ear (Pic. 57). This is often caused by an ear injury and subsequent infection. Clinical appearance. The first sign of perichondritis is pain in the ear area, swelling of the skin, and then, due to the formation of purulent exudate between the perichondrium and the eardrum, fluctuation occurs. Palpation of the auricle is painful.

Picture. 57.Perichondritis of the auricle

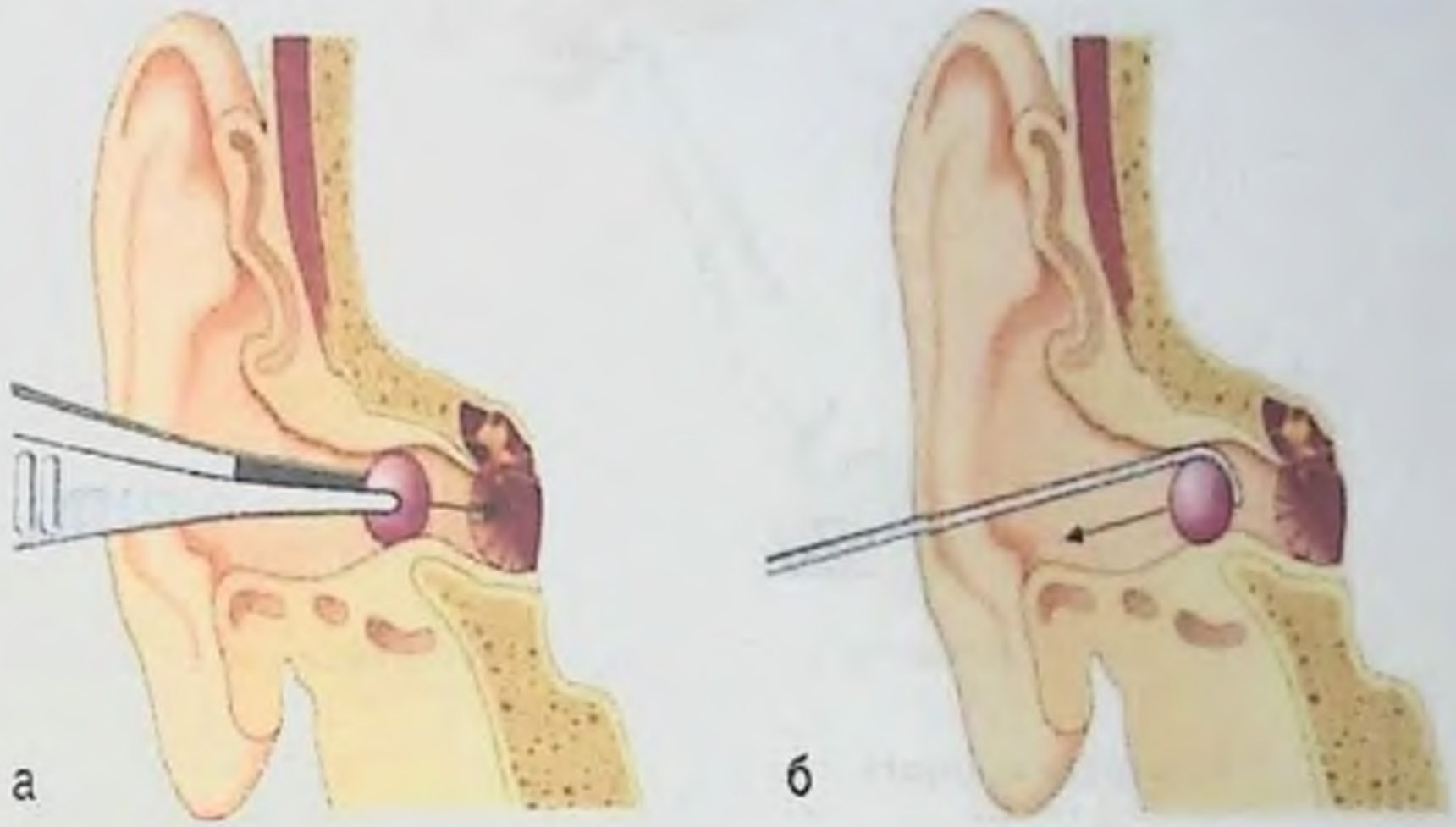
Diagnosing perichondritis is not difficult, but it should be differentiated from eardrum and hematoma and seroma.

Treatment. In the initial stage of the disease, anti-inflammatory treatment, broad-spectrum antibiotics, local antibiotic ointments, and physiotherapy are carried out. If fluctuation occurs, it is necessary to make a wide incision of the skin above the ear and remove necrotic tissue from the abscess cavity.

Foreign bodies of the external auditory canal. Foreign bodies of the external auditory canal include various objects: small insects, cereal seeds, metal particles, etc.

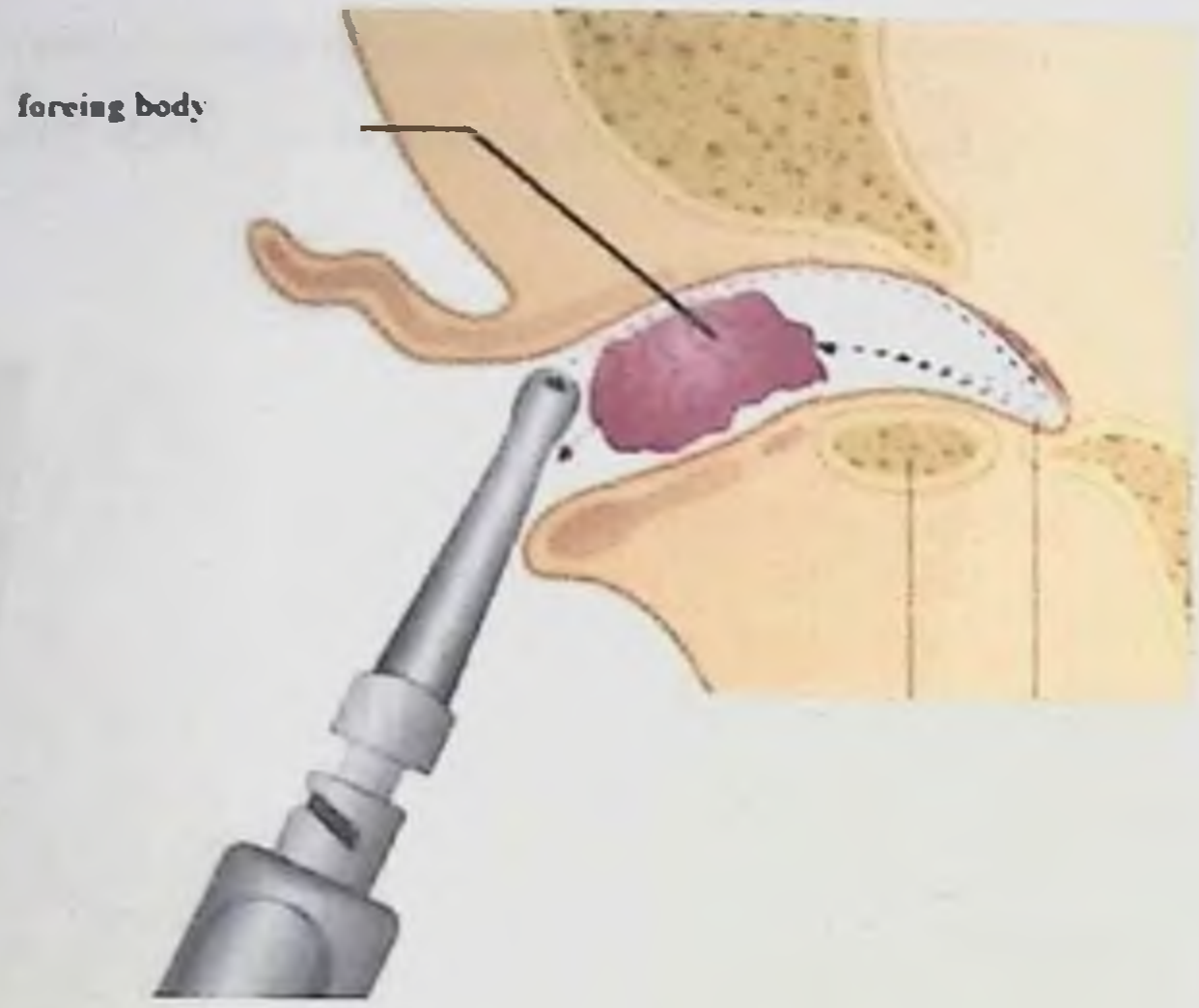
The patient complains of a feeling of interference in the ear, decreased hearing, sometimes pain, especially if the foreign body penetrates deep into the ear canal and touches the eardrum. Anamnesis is very important for clarifying the diagnosis. Finally, the question of the nature of the foreign body can be resolved during otoscopy. First aid can be provided to the patient only if the necessary conditions are met: the ability to remove a foreign body from the ear under visual control; availability of appropriate tools; reliable immobilization of the patient's head. Otherwise, it may aggravate the patient's condition, not only not remove the foreign body, but also injure the auditory tube, eardrum, auditory bone chain. It is

more convenient to remove foreign bodies from the auditory tube using a special hook. Washing the external auditory canal using Jane's syringe is effective (Pic. 58).



Picture.58.Removal of a foreign body of the external auditory canal: a - incorrect; b is correct

In such cases, the fluid should be directed along the posterior upper wall of the external auditory canal.



Picure:59. Washing of the external auditory canal

External ear injuries.

Damage to the auricle. Superficial damage to the ear can be caused by bruises, blows, etc. The auricle can be partially or completely severed. Infection of the wound of the auricle can lead to the development of chondroperichondritis, subsequent melting of the ear and deformation of the ear.

Treatment. Superficial injuries, i.e. abrasions and wounds, are treated conservatively (treatment with aseptic solutions). Primary surgical treatment for deep wounds involving partial or complete excision of the auricle is performed, and the wound is sutured.

Damage to the external auditory canal

Damage to the external auditory canal can be accompanied by an injury to the eardrum or can occur separately. Damage to the bony part of the external auditory canal can occur together with cheek and mastoid tumors, temporomandibular joint, tympanic cavity or inner ear injuries. Damage to the bony walls of the external auditory canal often occurs when a blow hits the lower jaw and the patient hits the chin. In such cases, a fracture of the front-lower wall of the external auditory canal occurs. This fracture is accompanied by bleeding from the

ear and pain when moving the lower jaw. Bleeding from the external auditory canal also occurs as a result of a fracture of the bony pyramid, which requires the patient to undergo additional CT examination of the temporal bone.

Diagnostics. The diagnosis is made taking into account the history of the disease, the results of the wound examination, probing, otoscopy, X-ray of the temporal bones and temporomandibular joint, as well as the study of hearing and vestibular function.

Treatment. First aid consists of primary surgical treatment of the wound with stopping the bleeding and treating it with a disinfectant solution. In addition, it is necessary to take measures to prevent further narrowing of the external auditory canal, atresia and temporomandibular joint dysfunction.

These measures are aimed at reducing complications of the external auditory canal, using anti-inflammatory ointments (levamicol, synthomycin ointment). Ointmented turundas are placed in the external auditory canal. Treatment of the external auditory canal begins with anesthetization. For this, a 2% solution of procaine (novocaine) is injected into the area above the horseshoe and local anesthesia is performed. For preventive purposes, tetanus antitoxin and antibiotics are prescribed. In the jaw joint by a dentist83septic83and should control the process. Injuries to the external ear can also be accompanied by damage to the pre-auricular salivary glands and facial nerves.

Autohematoma- this is a process of bleeding between the auricle and the perichondrium. This may be due to a sharp blow to the ear or prolonged squeezing of the supra. Autohematoma is common among athletes (wrestlers and boxers). Autohematoma is usually observed in the upper third of the front surface of the auricle. Autohematoma looks like a smooth cyanotic tumor that changes on palpation (Pic. 60). In mild cases, it may self-absorb and possibly suppurate the autohematoma, develop chondroperichondritis, and subsequently deform the auricle.

Treatmentautohematoma to the surface of the skin83After septic treatment, a puncture is made with a sterile syringe, the liquid contained in it (usually bloody

liquid) is sucked out, and then a pressure bandage is applied. If the autohematoma suppurates, its cavity should be opened wide by drainage. Antibiotics are prescribed taking into account the nature of the purulent flora and its sensitivity.

Picture. 60.*Autohematoma*

Cold throbbing above the ear(freezing)

Due to the fact that the auricle is more or less separated from the scalp and the blood vessels on its front surface are not surrounded by subcutaneous tissue, the phenomenon of freezing is observed in the ears when exposed to cold. Like frostbite of the external nose, there are three stages of frostbite of the auricle: erythema, blistering, and gangrene. The principles of treatment are the same as those used for external nasal frostbite.

Damage to the eardrum

In most patients with middle ear damage, a rupture of the tympanic membrane is detected. This can be caused by blows to the ear, barotrauma and manipulation of various objects in the ear. The perforation of the drum curtain can be slotted, dotted and round (Pic. 61). Damage to the eardrum is accompanied by pain in the ear, noise and hearing impairment. Through the hole created during otoscopy, you can sometimes see the medial wall of the tympanic cavity.

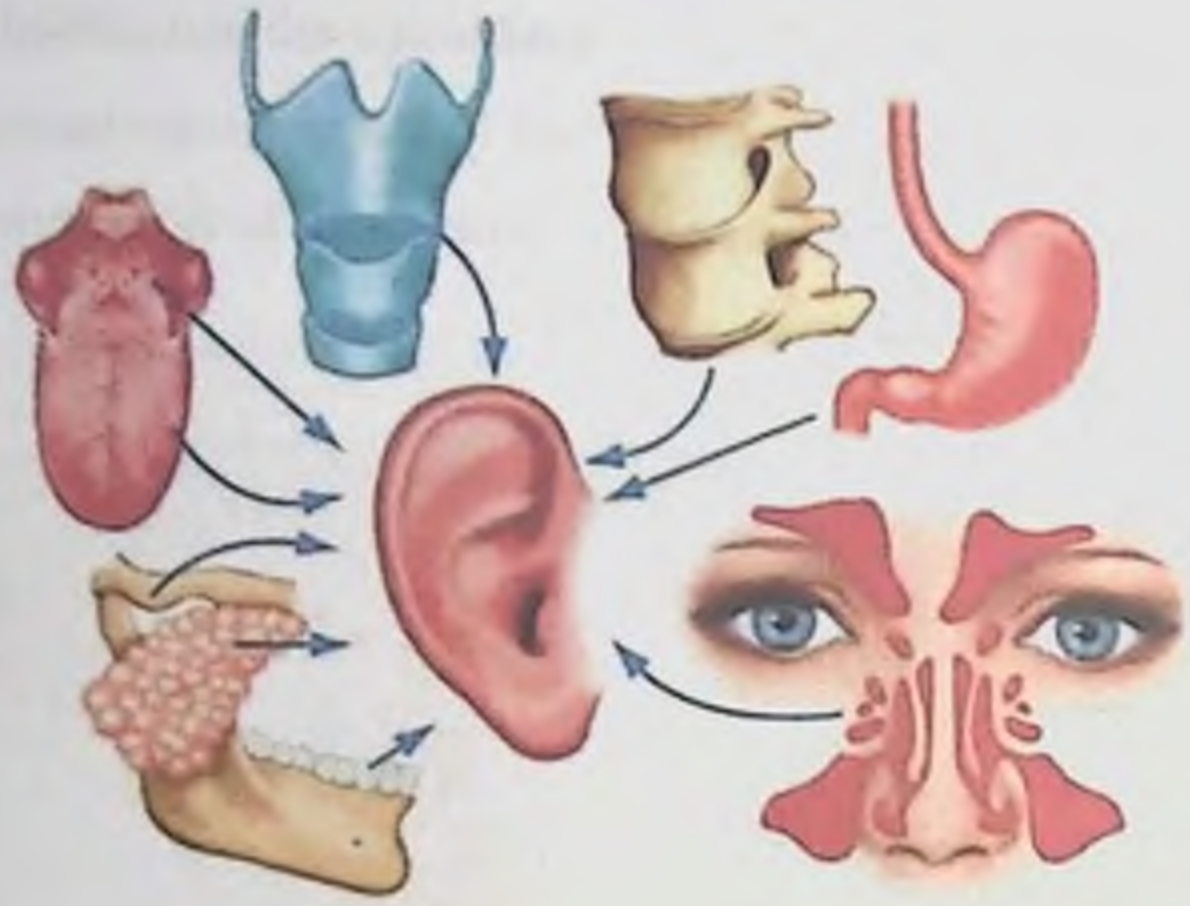
Treatment. It is necessary to protect the middle ear from infection through a defect in the tympanic membrane. First aid is limited to inserting a sterile swab into

the ear canal for several days. Antibiotics are prescribed. Self-healing of the ruptured eardrum is observed in half of the patients; better repair of the defect occurs when it is temporarily closed with a silastic film. If the defect does not heal on its own, myringoplasty is used.

Pic. 61. Injury of the tympanic membrane

Otalgia

Strong, paroxysmal pains located near the auricle or in the deep part of the ear, not associated with pathological manifestations in the ear itself, are called otalgia (Pic. 62).



Picture. 62.Possible complications of otalgia

The causes of otalgia can be pathological diseases in organs that receive common innervation with the external and middle ear. The nature of affecting the ends of the nerves involved in the innervation of the ear (tongue-larynx, trigeminal, stray) can cause pain reflected in a certain part of the ear. These nerve endings can be found in the mucous membrane of the mouth, throat and nose. Caries processes in the teeth, often in the lower eighth part, destructive changes in the root of the tongue, in the temporomandibular joint are the cause of sharp, paroxysmal pain in the ear that appears at uncertain intervals.

First of all, patients always consult an otorhinolaryngologist, because earache with otalgia is the leading symptom. Only asking the patient appropriate questions will allow you to identify other complaints: for example, the presence of a diseased tooth, a disease of the nasal cavity, among them. The examination leads to the identification of adenoids, the hypertrophied back of the lower jaws, inflammatory processes in the larynx and, first of all, on the larynx.

Therefore, the examination of a neuropathologist and a dentist is mandatory in patients with otalgia. Sometimes the sanation of the lower 8 teeth relieves the patient from ear pain at once.

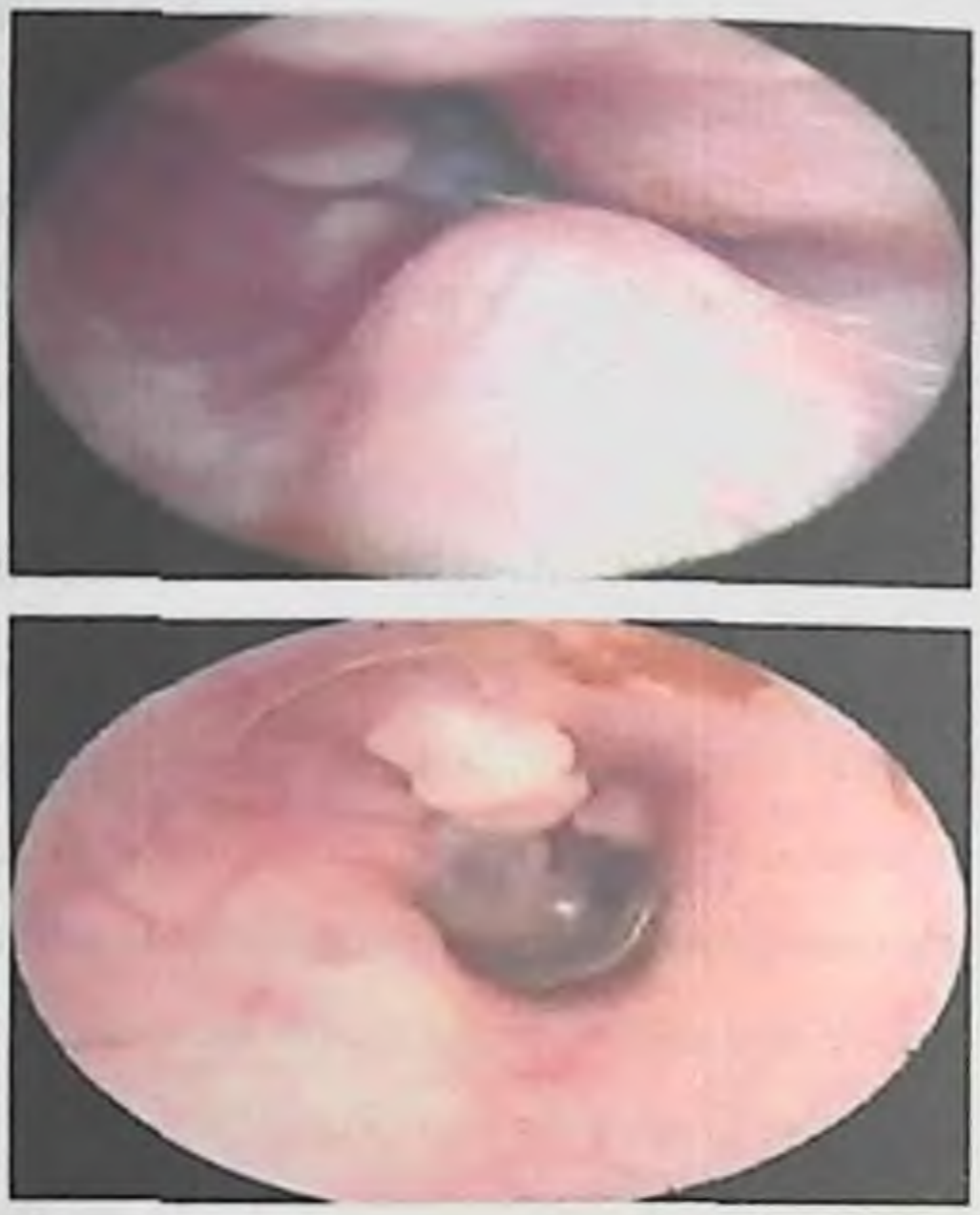
Otalgia should be distinguished from a number of neurological syndromes with similar clinical manifestations. Thus, patients with Kosten's syndrome

experience noise and pain in the ear, dizziness, hearing loss, headache in the upper region, pain and tightness in the temporomandibular joint. The cause of such a syndrome can be a pathological bite, as a result of which the articular head is displaced from its place, there is pressure on the neurovascular bundle passing through the stone-drum crack. Treatment at the dentist helps the patient get rid of pain.

External auditory canal exostosis. Exostoses of the external auditory canal are very rare; they are more common in men than in women. Exostosis is divided into congenital and acquired forms. Congenital exostoses, usually symmetrical in both auditory canals, almost touching the eardrum, skin-covered round occurs in the form Their size ranges from a millet grain to a pea; they are usually more than one. Exostoses are rare and can be located in the external auditory canal, mainly on the posterior superior or anterior wall (Pic. 63).

Their etiology is not clear. But the reasons for their appearance can be the long-term effect of the injury, inflammatory process on the external auditory canal. Common causes include rickets, gout, wounds, and finally, heredity. Age doesn't really matter. Exostoses usually appear after puberty.

It does not interfere with the patient when exostoses appear on their own, in which external hearing is facilitated. In such cases, patients complain of hearing loss, ringing in the ears, and heaviness in the head. X-ray helps determine the location and size of the exostosis. In case of severe disorders and purulent discharge from the ear, the exostosis interferes with its exit. Surgical removal of the exostosis leads to restoration of the external auditory canal.



Picture: 63.*External auditory canal exostosis*

2.2. Acute diseases of the middle ear

Middle ear diseases appear in different forms. They can be inflammatory in nature or represent the consequences of past inflammation (scars, adhesions, auditory bone disorders), and can also be the result of dystrophic processes (otosclerosis). All diseases of the middle ear primarily lead to hearing impairment and therefore have great social importance. Preventing hearing loss, taking measures to restore the lost hearing function occupies one of the leading positions in otorhinolaryngology.

Acute tubotitis (Eustacheite). - catarrhal inflammation of the mucous membrane of the auditory tube. Infection of the auditory tube occurs in acute respiratory diseases, flu. The resulting dysfunction of the auditory tube leads to impaired ventilation of the tympanic cavity. In acute tubotitis, the main complaints are ear congestion, hearing loss, autophony (the patient feels the resonance of his own voice in his ear). Otoscopy reveals indentation of the tympanic membrane,

blurring, and reduction of the light cone. Hearing is moderately impaired in the conductive type. Treatment of the disease is aimed at restoring the permeability of the auditory tube. Vasoconstrictor nasal drops should be prescribed (naftizin, sanorin, tizin, nazivin), antihistamines (suprastin, tavegil, loratadine), and others are among them. The auditory tube is inflated by the Politzer method (Pic. 64), the auditory tube is catheterized by instillation of a mixture of hydrocortisone and adrenaline. At the same time, physiotherapy is prescribed, pneumomassage of the tympanic membrane is performed.

Picure:64.Blowing the auditory tube according to the Policer method

Acute otitis media. Acute inflammation of the middle ear*(otitis media purulenta acuta)*- this is a process of inflammation of the mucous membrane that covers the three parts of the middle ear system - the auditory tube, the drum cavity, and the air cell system of the mastoid tumor. Acute otitis media can be catarrhal, serous or purulent depending on the type of inflammation or its stage.

The ways of infection to the middle ear are as follows:

- through the tube - passage of infection from the nasal part of the throat through the auditory tube;
- hematogenous - with blood flow in infectious diseases;
- lymphogenous - through lymph flow

- through the injured eardrum.

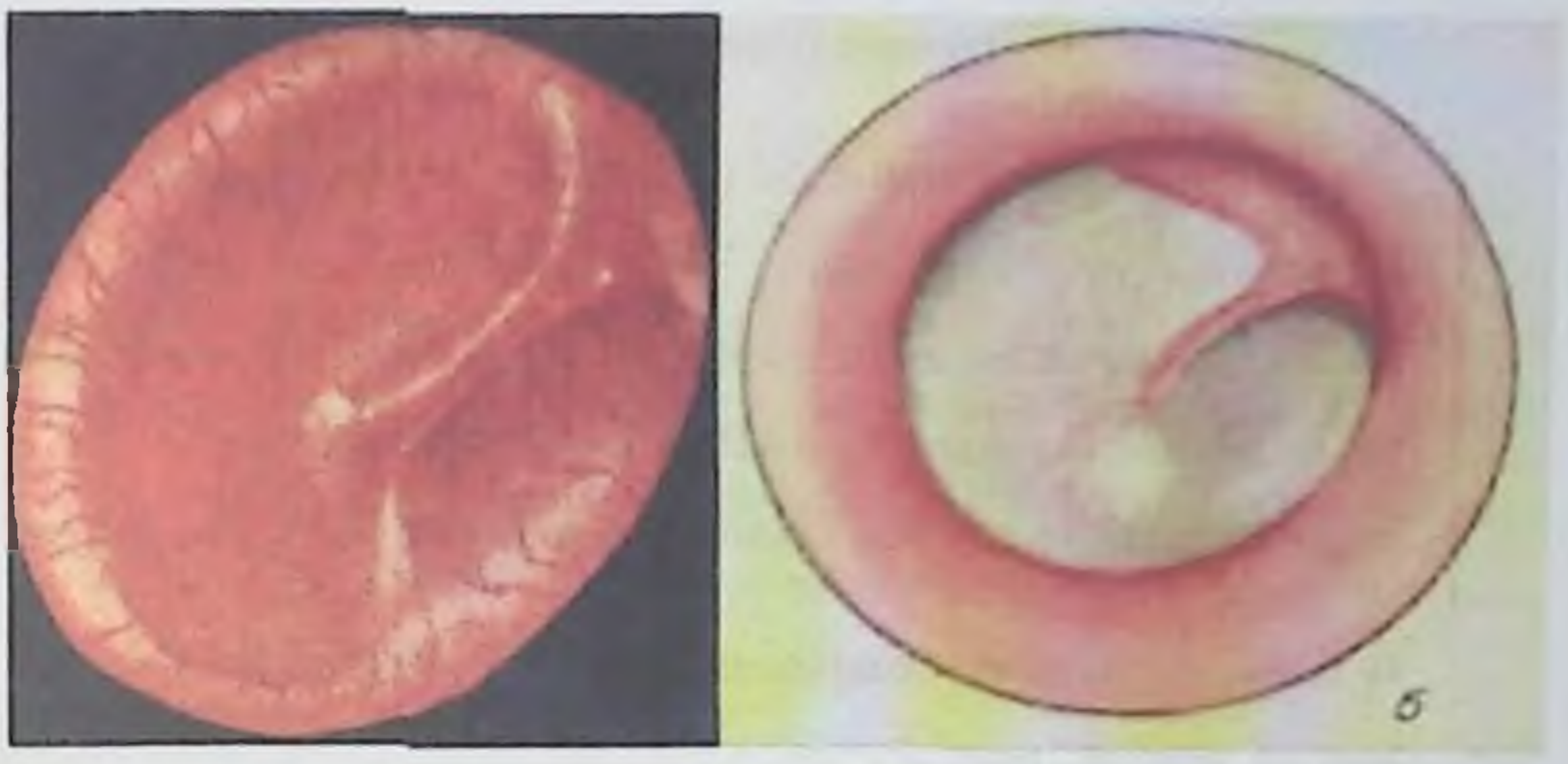
Sometimes, during infectious diseases (measles, rubella), the infection enters the middle ear through the cavity of the auditory tube, its ciliated epithelium ceases to function under the influence of measles, influenza, etc. Acute otitis media is a relatively common disease, especially in childhood. Its appearance is caused by diseases of the upper respiratory tract, adenoids, chronic inflammatory diseases of the nasal cavity and nasal cavities, general weakening of the body's protective forces.

The flora that cause inflammation of the middle ear are cocci (streptococcus, pneumococcus). The disease proceeds gradually and is divided into three stages:

- I - preperforative;
- II- perforation;
- III- reparative.

Each of the stages is characterized by its own characteristic signs, both clinical and pathological, as well as the treatment methods for each of them are as follows:

I stage- preperforative. Complaints: ear congestion, very severe pain in the ear, spreading to the temple, top, neck, teeth. Pain of a constant nature that grows rapidly and reaches the highest intensity from the first day. Sleep is disturbed, general condition changes, body temperature rises. Otoscopy: the tympanic membrane loses its external healthy appearance, the marking points disappear - the tympanic membrane is retracted, the handle of the hammer, the short end of the hammer protrudes, the light cone reduced or undetectable. The drum curtain becomes dull with a red color. (Picture: 65.).



***Picure:** 65.preperforative period; catarrhal otitis media*

Treatment. Vasoconstricting nasal drops (ephedrine, adrenaline, naftizine, galazolin, nazivin, eukazoline) are dripped into the nasal cavity with the patient's head tilted back. Painkillers (analgin, baralgin, ketonal) tablets, antibiotics are recommended. 3% boric acid, camphor oil, and glycerin are dripped into the external ear canal. A hot compress (wrapped in several layers and soaked in an alcohol solution) is applied to the area of the mastoid tumor. Gauze is placed on the nipple, above and in front of the auricle.

If the pain does not decrease within 2 days, but rather increases, if there is no spontaneous perforation of the tympanic membrane, if there are signs of complications (signs of migraine, high body temperature), then a paracentesis operation is performed. that is, opening the drum cavity by cutting the drum membrane. (Picture: 66.).

Picure:66.*Exudative otitis media, Paracentes*

Paracentesis is performed in the posterior lower quadrant of the diaphragm, at its most prominent point. Paracentesis not only helps to speed up the inflammatory process in the middle ear, but because it is done without waiting for the membrane to rupture by itself, it prevents the appearance of a permanent hole in the tympanic membrane, because the smooth edges of the cut grow quickly.

II stage- perforation; Complaints: discharge of purulent discharge from the ear, loss of hearing, pain decreases and gradually disappears. Otoscopy: purulent secretions accumulate in the external auditory canal, they are under pressure with pulsation the drum is seen coming out of the needle-like hole of the curtain. (Pic. 67).

Picture: 67. *perforative period; Acute purulent otitis media*

The hole may not be visible, because it has a crack-like shape and is marked only by the purulent secretion that flows from the place of occurrence. The veil itself is thickened and hyperemic, and identification points are not visible.

Anamnesis does not always provide information about the cause of hearing loss, except for trauma, previous illness, or the use of drugs (antibiotics, diuretics). Sometimes the deafness comes on suddenly and severe dizziness can occur. In cases of such acute hearing loss, it is necessary to immediately admit the patient to the ENT department of the hospital in order to provide timely help, which can be effective in urgent cases.

Hearing aid adjustment and audiometry studies are crucial to clarify the diagnosis. With audiometry, the tonal limits of air and bone conduction are increased parallel to each other and do not have a bone-air gap.

Treatment. In the case of sudden and acute hearing loss, treatment should be started as early as possible, during the period of reversible changes in the nervous tissue. Such patients are considered urgent patients, they are urgently admitted to the hospital. Treatment should be aimed at eliminating or neutralizing the causes of the disease.

III stage- reparative; The patient's condition is satisfactory. Otoscopy does not reveal any changes in the tympanic membrane, the membrane looks normal. Hearing is fully restored (Pic. 68).

Picure: 68. *reparative period: Acute otitis media*

Recurrent otitis media- inflammatory process of the middle ear several times after a year of recovery (otoscopic appearance is normal, perforation is closed and hearing is restored). It occurs in children aged 2 to 5 years.

Reasons. The causes of recurrent diseases (up to 5-6 times a year) can be local and general.

Common causes include recurrent pneumonia, exudative diathesis, nutritional disorders, allergies, and immunosuppression. Local causes include enlarged adenoid vegetations, polyps of the nasal cavity, sinusitis, hypertrophy of the nasopharynx and palatine glands.

The nature of the infection is important in the process of recurrence. In addition to Pneumococcus, Staphylococcus aureus et epidermidis, Chlamydia, Mycoplasma and Haemophilus influenza are found in 20% of cases.

Clinic. The clinical course is usually mild. The disease is observed with perforation of the tympanic membrane. In perforation, the tympanic membrane is dim, slightly hyperemic, thickened; the perforation is not very large, it is located in the front-lower quadrant; secretions are mucoid or muco-purulent, abundant, runny, odorless.

In the absence of perforation, the first symptom is mild pain and a feeling of stuffiness in the ear. Diagnosis. Relapsing otitis with perforation is easy to diagnose. Diagnosing recurrent otitis media without perforation is somewhat complicated, because children do not always complain of hearing loss, especially if the process is unilateral, body temperature does not rise, and intoxication is not observed. ThisIn order to determine the diagnosis during the period, examination using acoustic impedancemetry in children has an important place.

The cure. Treatment of recurrent otitis is carried out in two stages.

At the first stage, the treatment is aimed at eliminating the recurrent process:

the ear is thoroughly cleaned, the auditory canal is cleaned of pus or mucus, alcohol drops are dripped;

- suction of pus and sending drug solutions (antibiotics, hormonal preparations, proteolytic enzymes) to the drum cavity with a syringe through the perforation hole gives a good effect;
- conservative treatment of concomitant diseases of the nasal cavity, paranasal sinuses and nasopharynx is carried out at the same time;

- after the sanitation of the upper respiratory tract, it is prescribed to clean the ear with the help of air flow in order to remove the exudate, to restore the permeability of the auditory canals and hearing;
- antibiotics are rarely prescribed during this period.

The second stage (period of remission) is the main one, the purpose of which is to prevent recurrence. During this period, the treatment is complex and is carried out in cooperation with the pediatrician.

Identifying common causes is of great importance. For example, relapse processes may not be observed if the mother of a breast-fed child changes her diet.

Deficiency in the immune system of children with recurrent otitis media has been proven, which is expressed by low general and local immunity, a decrease in T-lymphocytes, a lack of secretory and humoral complexes, immunoglobulin G, A, E. Therefore, gamma-globulin, plasma, methyluracil, ascorbic acid, dibazol (interferon inducer), lysozyme and hz are added to the treatment.

During the period of remission, local conservative and surgical treatment is actively carried out. Pneumo- and vibromassage of the eardrum, cleaning of the auditory canals in air flow is performed. According to the instructions, vasoconstrictor drops, sugar-free gum, puncture, adeno- and tonsillotomy are used to treat sinusitis when required. In some cases, only the removal of adenoids does not restore the auditory path, which should be done together with gymnastic exercises, electroreflexotherapy, vibro- and pneumomassage of the tympanic membrane in order to improve its muscle function. Stable effectiveness in treatment is achieved by extracorporeal irradiation of one's own blood with ultraviolet light, exposure to a helium-neon laser in combination with other methods.

In some cases, recurrence of otitis media is observed despite the use of all measures aimed at restoring the conduction of the auditory canal, targeted antibiotic therapy and strengthening the child's body. This is explained by the presence of destructive changes in the mammary tumor. In such a situation, surgical

treatment is required. It can be minimal (myringotomy, tympanopuncture in the absence of perforation, antrodrainage), and sometimes the opening of mastoid tumor cells (antromastoidotomy).

Complications. The risk of recurrent otitis media is expressed by a sharp decrease in hearing ability, intellectual and speech development defects in children in early childhood. When low hearing is suspected, especially if the process is bilateral, the child is immediately diagnosed by a specialist using audiological diagnostics, acoustic impedancemetry. Recurrent otitis media eventually leads to permanent perforation of the tympanic membrane, that is, chronic otitis, with all complications.

Exudative (secretory) otitis media–is a specific type of inflammation of the middle ear, characterized by the formation and long retention of transudate in the tympanic cavity. It is more common in children than in adults. It is diagnosed in 60% of children aged 3-7 years, in 100% of children aged 12-15 years.

Reasons. There are various causes of exudative otitis media. They can be conditionally divided into general and local.

Common causes include decreased immunity, allergies, specific diseases that lower immunity, environmental factors, and frequent infectious diseases. About 1/3 of children have an adenovirus infection.

The basis of the local causes is the violation of the ventilation activity (mechanical or functional) of the auditory tract caused by the hypertrophy of the palatine glands or the slow inflammatory-allergic process in it.

Pathogenesis. As a result of violation of ventilation activity, a vacuum appears in the drum cavity and serous transudate is formed. The term "serous otitis" can also be found in the literature.

Transudate is usually liquid, but in some cases, as a result of hypersecretion of the mucous membrane of the tympanic cavity, its content of protein increases and

it becomes dark, viscous. Therefore, exudative otitis media is sometimes called "sticky ear", secretory otitis, mucoid otitis.

Due to the mixing of blood from the capillaries of the mucous membrane of the drum cavity into the transudate, the liquid becomes bloody, so the disease is called hemorrhagic serous otitis.

In the mechanism of emergence of exudative otitis, the use of antibiotics in acute middle age and failure to perform paracentesis, poor cleaning of the tympanic cavity, dysfunction of the soft palate muscles, and clefts of the hard palate are listed. tooth can

Clinic. In the clinic of exudative otitis, symptoms are rarely expressed in children.

The only symptom may be hearing loss and sometimes tinnitus. However, children aged 2-5 years do not complain of low hearing, especially if the process is unilateral, exudative otitis media is detected accidentally.

Diagnosis. Anamnesis information about recent ear diseases, the date and the course of treatment is considered very important.

Although changes in the tympanic membrane are different, accurate information is determined by otoscopy. Sometimes it is dull, thickened, slightly twisted space or has a bluish color in some areas. In some cases, the tympanic membrane becomes thinner, and the level of transudate is visible in the light. In general, it is possible to determine the nature of the exudate to a certain extent in otoscopy. It is important to check the ventilation activity of the auditory canal, the mobility of the eardrum through a pneumatic funnel, tubosonometry.

The main place in the diagnosis is the examination of hearing ability. In exudative otitis media, the hearing loss is less, the conductivity is 30-40dB. Sometimes hearing is lost as a result of a violation of bone conduction (exudate blocks both windows of the bone labyrinth).

In some cases, hearing loss is fluctuating rather than constant.

In recent years, with the advent of acoustic impedancemetry, it became possible to make a comparative diagnosis of the sound transmission and reception apparatus in children aged 2-4 years.

In the diagnosis, it is necessary not to forget the reduction of pneumotization of mammary tumor cells in X-ray data. CT examination of the temporal bone can be used in difficult diagnostic situations.

In recent years, direct endoscopic examination of the child's nasopharynx cavity has entered otorhinolaryngology. Previously, this method was complicated and limited to palpatory and X-ray methods. The use of hard and soft endoscopes (fibroscopy) made it possible to carefully study the laryngeal openings of the auditory canal and to study the causes of the blockage of the auditory canal. The information obtained from this method plays an important role in the choice of conservative and surgical treatment methods.

The cure. When causes such as adenoid, choanal polyp, auditory glands and hypertrophy of nasal conchas are identified, they are eliminated first, besides sanation of adjacent nasal cavities is carried out.

The next step is aimed at restoring the conductivity of the auditory pathway. For this purpose, electrophoresis with lidase, electrostimulation of soft palate muscles, magnetotherapy, ultrasound, and laser therapy in the early stages of the disease are used. In many cases, in order to restore the permeability of the auditory canal, its muscle tone, and to eliminate the exudate in the eardrum cavity, diadynamic currents, cleaning by the Politzer method, and pneumomassage of the eardrum are performed.

Since the child is directly involved in these procedures, it cannot be used in early childhood. For this reason, ear catheterization and transtubal delivery of drugs are limited in young children. In severe cases, these procedures are performed using elastic rather than metal catheters.

As an important step, it became possible to implement the treatment complex by viewing through fiberoscopy.

Since the allergic background is common, antihistamine and steroid drugs, vitamin A, and sulfur drugs are used.

From surgical methods, tympanopuncture, myringotomy can be used, but these methods can be used once mainly to remove serous fluid.

A tympanotomy is performed to introduce a polyethylene tube for 2-3 weeks in order to create permanent drainage and send drugs to the drum cavity, improve its aeration. An operation in which a special shunt (Pic. 2.58) is placed on the tympanic membrane is widely used. The shunt drum is left on the curtain for 3-4 months, then it is removed, and sometimes it falls off by itself. Medicines that reduce secretion or dilute it, such as hydrocortisone or animal enzymes (trypsin, chymotrypsin), are injected through the shunt.

Complication. If a child with exudative otitis media is not treated, after about 3-4 years, persistent and even irreversible hard ear, adhesive scarring process in the middle ear, cavities and perforation will appear in it as a result of atrophy of the tympanic membrane. develops as a result of The sound receiving apparatus may also be partially damaged.

Mastoiditis- purulent inflammation of a mastoid tumor. In most cases, it is secondary (a consequence of inflammation of the tympanic cavity), but primary mastoiditis can also occur after trauma to the mastoid tumor.

Acute inflammation of the middle ear can be complicated by acute mastoiditis when a child develops a mastoid tumor at about 1.5-2 years of age. This is observed in approximately 2-5% of cases.

General and local factors are the impetus for the development of such a complication.

Common factors include rickets, tuberculosis, exudative diathesis, virulence of microflora, which does not differ from acute otitis media.

Factors complicating the discharge of pus due to local causes: narrowing of the auditory tube, hypertrophy of the tube and laryngeal glands, a narrow entrance to the cave, small perforation or untimely paracentesis, protrusion

of the inflamed mucous membrane from the perforation of the tympanic membrane and hz enters.

In all processes, inflammation develops in the cells of the mammary tumor. Its mucous membrane is swollen, infiltrated, individual cells are connected to each other, and the entrance of the drum cavity to the cave has deteriorated; as a result, osteomyelitis develops in the thin bones of the mammary tumor cells. Individual cells are combined into a common or several large spaces.

Clinic. Acute mastoiditis can develop at any time during the course of acute otitis media, but usually this phenomenon can occur in 3-4 weeks, against the background of recovery.

The child has a sudden rise in body temperature to 39-400C, increased pain in the ear, sometimes some neurological symptoms appear as a result of intoxication.

The transverse fold in the back of the ear is flattened, the skin is swollen, reddened, painful on palpation. After a certain time, the auricle becomes larger. The external auditory meatus narrows, the insertion of the funnel becomes painful, the posterior-superior wall hangs because it serves as the front wall of the mammary tumor cave. Narrowing pus occurs as a result of pressing this wall with pus or its periostitis.

Through the perforation hole, the pus comes out faster, and after its removal, the oozing lumpy pus appears again in the external auditory canal. A pulsating reflex is usually detected.

Diagnosis. The final diagnosis is made after X-ray examination of the temporal bones. X-rays reveal the destruction of mammary tumor cells and the formation of a general void.

A comparative diagnosis is made with neck lymphadenitis behind the ear and furuncle of the external auditory canal.

Hearing impairment is similar to acute otitis media by the conduction type, and neurosensory hearing loss occurs as a result of toxins entering the inner ear through the labyrinthine window.

The cure. Treatment tactics for acute mastoiditis are different and depend on many specific conditions.

In normal cases, the treatment begins with conservative antibiotics, sulfonamides, and periosteum training.

Subperiosteal abscess, atypical mastoiditis such as Betsold's and Mure's, and obvious intoxication are indications for surgical treatment.

In such a situation - mastoidectomy operation - cells of the cavernous and mastoid tumor are opened, carious tissue removal is performed behind the ear (simple trepanation of the mastoid tumor). Despite being a radical method, this operation does not cause hearing loss, since there are good conditions for pus to come out at the entrance of the cave, the inflammatory process is eliminated from the drum cavity without any complications. Naturally, such a situation also occurs in the antrotomy of breast-aged children.

Urgent surgery is also indicated for intracerebral complications and acute purulent otitis media.

Complication. Atypical types of mastoiditis. Under the influence of pneumatization of the temporal bone and a number of factors, sometimes the purulent process can develop and spread in the adjacent areas.

One of the ways of the spread of pus is the apex of the mastoid tumor. Pus can erode its thin inner plate and pass under the muscles of the neck to the coccyx. It is very dangerous – Betsold's mastoiditis.(Pic.69).

Picure: 69. *Betsold's mastoiditis.*

In mastoiditis, the appearance of swelling in the neck area and restriction of its movements should prompt the doctor to be alert to Betsold's mastoiditis. Outflow of pus outside the apex (Mure's mastoiditis) is considered relatively safe as it does not lead to mediastinitis.

Subperiosteal abscess. In most cases, the bone plate in the area of the lateral wall of the mammary tumor is destroyed, pus moves under the periosteum and a subperiosteal abscess occurs.

The next way of development of subperiosteal abscess is associated with the release of pus through the drum-stomach-like hole. It is easy to make a diagnosis, since the fluctuation is detected on palpation.

A subperiosteal abscess can open independently from the skin or the back wall to the external auditory canal, but in most cases surgical intervention is required.

Zygomaticitis -this cheek complication of inflammation and acute otitis media. Most cases of zygomaticitis are observed in early childhood.

Reasons. Anatomic features play an important role in the development of the disease, including the early appearance of air cells in the cheek tumor and its direct connection with the drum head.

In many cases, zygomaticitis is accompanied by acute diseases of the middle ear. Zygomatitis is rarely observed as a complication of chronic otitis media. Usually, zygomaticitis develops together with acute mastoiditis, because the cheek and mastoid tumor form a single pneumatized system.

Clinic. Zygomatitis is expressed by high (390C) body temperature, obvious intoxication. A diffuse swelling appears in the area of the cheek tumor and spreads uniformly in all directions. In children, the fissure narrows as a result of impaired blood and lymph circulation in the cheek area on the affected side. Periostitis causes swelling and pain when palpating this area.

In zygomaticitis, otoscopy shows a hanging of the skin of the upper or upper-frontal bone wall of the external auditory canal.

Subjective signs include the presence of severe pain when moving the lower jaw. Conductive hearing loss is detected.

Comparative diagnosis. Zygomatitis should be diagnosed comparatively with autogenous lymphadenitis, otitis externa and parotid.

The cure. In case of mild, satisfactory condition, body temperature and local changes that are not clearly expressed, antibiotics, physiotherapeutic procedures and local drugs are used for conservative treatment.

When the effect of conservative treatment is not noticeable after 3-4 days, surgical treatment is performed in severe disease. During the operation, bone erosion and granulations are detected on the basis of the cheek tumor.

2.3 Chronic diseases of the middle ear

Chronic purulent otitis media -is a form of inflammation of the middle ear and has 3 symptoms: persistent perforation, constant or periodic suppuration and progressive hearing loss.

A common disease among children and adults. It occurs in about 1% of school-aged children. When accurate data is obtained among 14-15-year-olds before the draft, this indicator has 3-4%. More than half of adults had otitis in childhood.

Chronic purulent otitis media occupies 60-70% of cases of hearing loss in patients with damage to the sound transmission apparatus; in about 80% of children, the onset of the disease is associated with ARVI, and in 5-7%, it is associated with other children's infectious diseases.

Reasons. In most cases, chronic purulent otitis media occurs after inflammation of the middle ear. There are general and local reasons behind this situation.

Common reasons: high virulence of the microflora represented by hemolytic streptococcus, proteus, anaerobes (severe general infections), staphylococci or atypical bacteria (chlamydia, mycoplasmas);

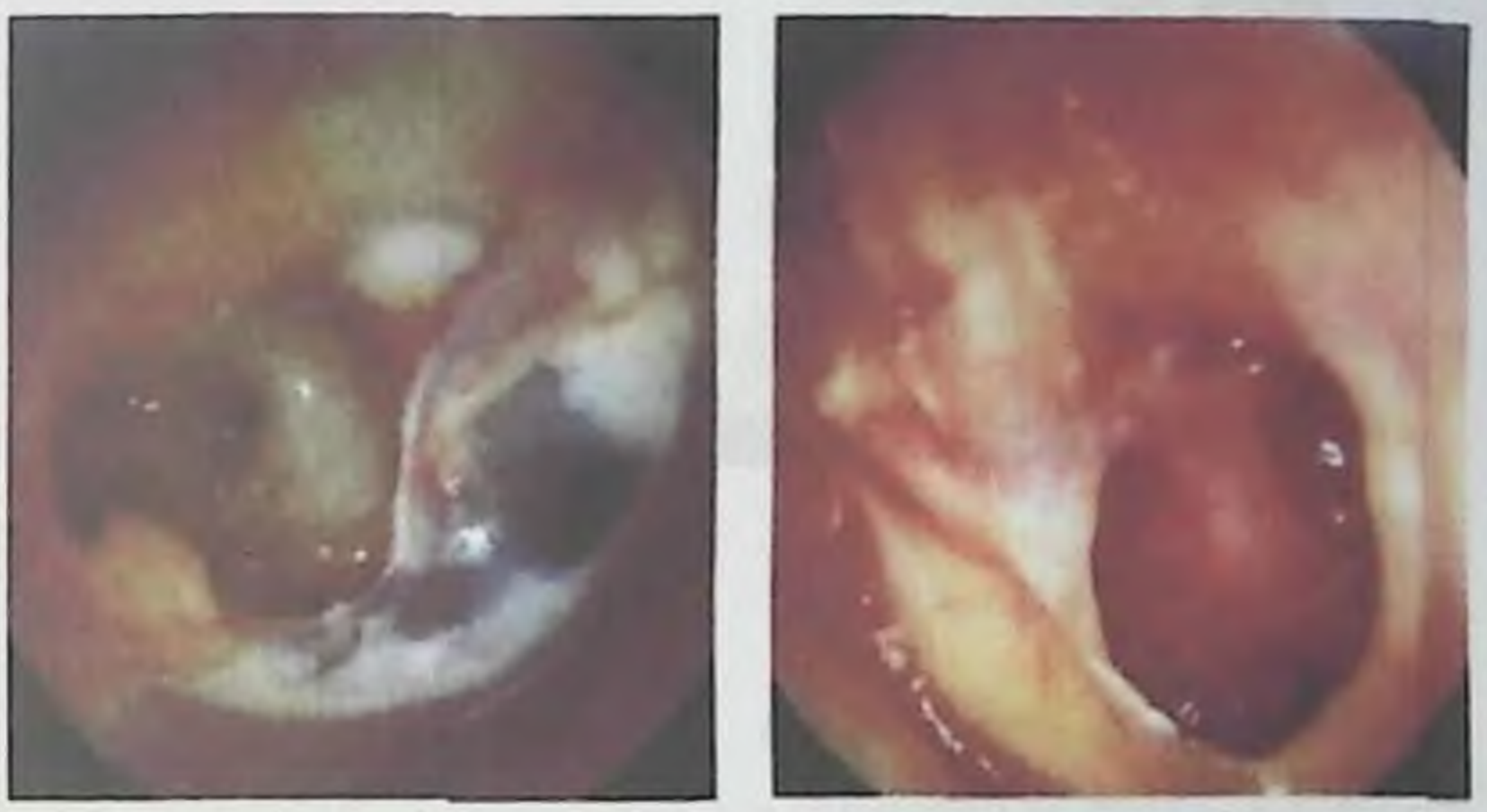
- eating disorders, severe avitaminosis;
- genetic predisposition;
-allergy, decreased immunoreactivity of the body;
chronic diseases of respiratory and gastrointestinal system;
- ineffective treatment of acute otitis media;
- frequent inflammation of the middle ear;

Local causes:

- hearing impairment;
- adenoid vegetations of the nasopharynx;
- chronic inflammation of the nose and adjacent nasal cavities, nasal polyposis;
- hypertrophy of the rear and front ends of the lower nasal concha, which leads to tubotitis and auditory canal dysfunction;
- anatomical specificity of the structure of the middle ear in children: poor connection between the cells of the attic (epitympanum) and the mastoid tumor due to the closure of the mastoid cavity, easy swelling of the mucous membrane, the presence of many folds makes it difficult for drainage and pus to come out of the middle ear in acute otitis media;
- poor pneumotization of a mammary tumor, its spongy or sclerotic type;
- good connection with blood-vessel and gonaco-cerebral cavities, which leads to the development of osteomyelitis in the child's ear.

Clinic. Chronic suppurative otitis media can occur in two forms: relatively benign mesotympanitis (in more than half of cases) and severe epitympanitis (20% of cases), the remaining 30% are mixed forms - epimesotympanitis.

In mesotympanitisonly the mucous membrane of the middle ear is affected, in epitympanitis bone tissue is added to the process. Therefore, it is very important to make a comparative diagnosis of these two forms of chronic otitis media.. (Pic. 70).

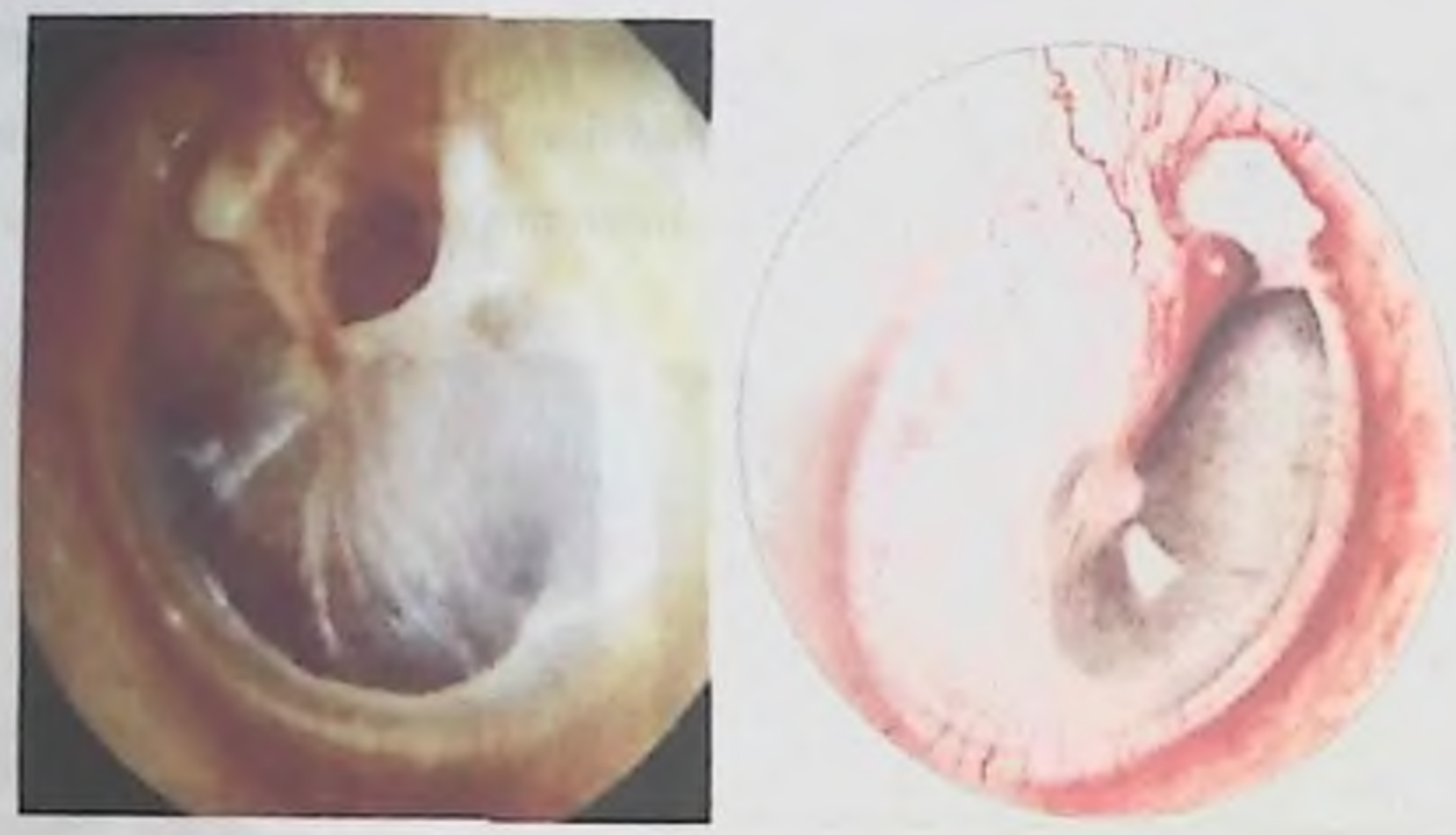


Picture: 70. *Chronic mesotympanitis*

The disease occurs in two forms. In the first, the symptoms of the chronic process are constant dry perforation of the eardrum and constant decrease in hearing.

From time to time, after an infectious disease or after an infection (usually water) enters the drum head through a perforation hole. body temperature rises, pain in the ear, signs of general intoxication, discharge, hyperemia of the drum membrane, etc. Neurological symptoms may be observed.

In the second form of epitympanitis, although the general condition of the child is satisfactory, mucous or purulent discharge comes from the ear. Such children have general symptoms (fever, headache, signs of intoxication) and painful discharge during the disease attack (Pic. 71).



Picure: 71. Chronic epitympanitis

Diagnosis.A. of the diseasenature is important. In particular, a chronic process cannot be determined at a glance. In order to make a comparative diagnosis of recurrent or prolonged acute otitis media, a complete anamnesis should be collected. Information about past illnesses is clarified. Usually, this condition appears after measles, diphtheria or influenza. The degree of severity of the disease is determined by a certain amount of recurrence of otitis, course and discharge of pus. During the attack, it is observed with a rise in temperature, signs of intoxication, severe pain in the ear, neurological symptoms (headache, dizziness, static disorder).

Otoscopy. In chronic purulent otitis media, the perforation hole has different shapes (round, kidney-shaped and etc) and sizes. The main feature in the comparative diagnosis of meso- and epitympanitis is the preservation of the edges of the tympanic membrane. If the edge is preserved, the perforation is called central and is typical for mesotympanitis..If, without an edge, the perforation reaches the drum ring, it is called edged and is typical for epitympanitis.

The nature of separations. Mesotympanitis is characterized by mucous discharge, which is abundant and odorless. If the bone tissue is involved in the process, the secretions will be cloudy, dark, with the smell of ichorosis due to the onset of osteomyelitis. Although the amount of discharge in the ear is not diagnostically important, in mesotympanitis the perforation is in front of the opening of the auditory canal, and the discharge is very large.

This form of mesotympanitis is also called chronic tubotitis.

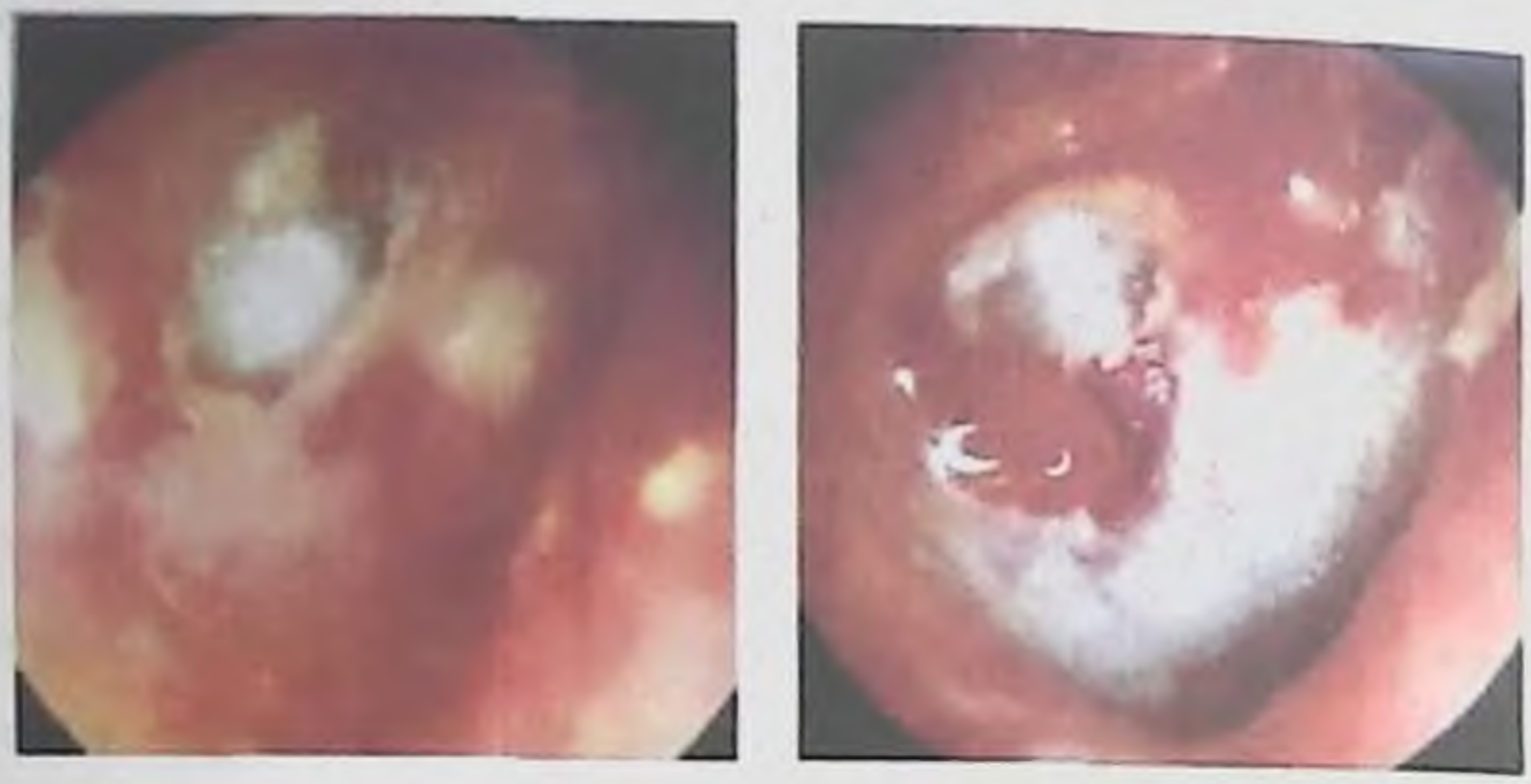
Pathological tissue changes. The process of osteomyelitis in epitympanitis is expressed by the development of granulation. They are sometimes visible from the perforation, and blood is mixed with the discharges in the ear. Granulations protrude from this hole into the auditory canal and have the appearance of a polyp.

In rare cases, ear polyps can also appear in mesotympanitis due to continuous exposure of the mucous membrane of the tympanic cavity with pus. Specific cholesteatoma especially in epitympanitis it is necessary to pay attention to the tumor-like formation known as It occurs in 20-30% of children treated with chronic otitis, twice as often in boys. Its pathogenesis has not been fully studied.

Many theories (tumor, epiblastic, devascular, migratory, inflammatory, etc.) do not fully explain the mechanism of its occurrence. Some authors focus on the genetic factor and emphasize that cholesteatoma occurs as a result of metaplasia of the middle ear epithelium in a special anatomical feature. Others argue that cholesteatoma results from epithelial growth of the auditory canal into the tympanic cavity in the absence of mechanical barriers such as tympanic membrane remnants in a pointed perforation. (Picure 72).

Masses of cholesteatoma are saturated with cholesterol, wastes of life activities of microorganisms, residual epithelium, continuous growth of cholesteatoma Cochlea (matrix) and atrophy and destruction (lysis) of

some areas of the temporal bone are observed. That is the nature of cholesteatoma.



Picure: 72. Cholesteatoma

Cholesteatoma is rarely observed in mesotympanitis (about 3-5%). Diagnosing cholesteatoma is not easy. In older children, the attic can be probed through the perforating hole, where the soft and hard bone is identified. Sometimes, with the help of a special cannula, it is possible to wash the attic through the perforation hole and see the remnants of the cholesteatoma in the liquid. In young children, this is not possible, only as a result of X-ray, the defect of the temporal bone indicating cholesteatoma can be seen in the form of illumination.

Cholesteatoma in children has few symptoms with specific characteristics; formed in a short time; Grows quickly in children under 5 years old;

compared to adults, damage to the walls of the head and tympanic cavity, caverns, semicircular canals and facial nerve is rare;

in the upper parts of the tympanic cavity, retraction is often repeated as a result of relapses into the sinuses;

Hearing test. It is very important to check hearing function, regardless of the level of hearing loss. In mesotympanitis, low hearing is well expressed as a result of impaired conduction in the ossicular system. In epitympanitis, however, hearing

is relatively unchanged, as the cholesteatoma masses and granulocytes are to some extent transmitted. In diagnosis, the inner ear is involved in the process in epitympanitis and is expressed by a decrease in bone conduction in the audiogram.

Radiography. The diagnosis of small middle ear cholesteatoma is complicated. Accurate information about the process is obtained when the projections are selected correctly. Currently, Schueller and Mayer projections are widely used.

In the exacerbation of the process, the clear outline of the sclerotic bone disappears because it is included in the inflammatory process. In such a situation, transorbital projection (according to Highway) is used, because the superposition (overlapping) of dense formations is reduced, and a very small cholesteatoma located in the attic and cavernous opening can be identified.

Comparative diagnosis. Chronic purulent otitis media is sometimes compared with tumor and histiocytosis. Ear pathology is detected in about 70% of children with histiocytosis. Symptoms of histiocytosis:

multiple defects of bone tissue, isolated or systemic damage with sequestration and purulent area;

growth of specific granulation tissue (eosinophilic granuloma);

total lymphadenopathy with hepatosplenomegaly;

damage to the skin; exophthalmosis as a result of xanthoma nodes along the optic nerve of the anterior cerebral cavity; damage to the flat bones of the head (primarily the temple).

Rarely, middle ear sarcoma occurs in children. It develops as an early derivative in childhood. White-pink bleeding granulocytes are detected in the external ear, biopsy allows to make an accurate diagnosis. The spread of the process is shown by CT data. Although the treatment is radiation and surgery, it is ineffective due to rapid metastasis.

Treatment depends on the stage of the disease, the method of treatment, the duration of the disease, the rate and severity of recurrence, otoscopic appearance, radiological data, hearing activity and frequency.

It can be said that conservative treatment is used in chronic purulent mesotympanitis, and surgical treatment is used in epitympanitis.

Anti-inflammatory antibiotic therapy, as well as local treatment, are used in the case of exacerbation of the process with pain in the ear, discharge of pus or intensification. In the period of remission, when there is no exacerbation, when there are no general symptoms, when pus continues to appear, it is mainly treated locally (antiseptic, usually alcohol drops, sulfanilamide dusting).

Helium-neon laser irradiation is also effective. Contraindication to laser therapy: ear polyps, cholesteatoma, chronic otitis with symptoms of mastoiditis, intracerebral complications. Laser irradiation leads to reduction of otorrhea, reduction of tissue swelling and hyperemia. Conducting laser therapy in children requires staff to strictly follow safety rules. There are many local methods of treatment, but for a good effect of the drug on the ear mucosa, the removal of pus-cleaning the ear is considered the most important. With steady and moderate treatment, 80-90% of mesotympanitis can stop pus.

If the child applies when the process has not escalated and pus has not appeared, then preventive measures are used:

- nasopharyngeal rehabilitation;
- treatment of chronic diseases of the nose and nasal cavities;
- general and local training for the prevention of respiratory diseases;
- prevention of water getting into the ear, because water can cause pus to come (when bathing the child or washing the head, the ear is closed with a cotton pad saturated with sterile vaseline).

Semi-surgical (removal of perforation edges and cauterization) and surgical (high-energy laser exposure and myringoplasty) methods are used to close the perforation.

Effective conservative treatment is difficult in chronic purulent epitympanitis, as it is expressed by the formation of granulation, polyps or cholesteatoma.

Methods of treatment (local and general) used in epitympanitis can prevent recurrence of the process, but cannot prevent the development of osteomyelitis. In this process, surgical treatment is possible, but hearing loss as a result of the operation prevents this.

In recent years, limited operations have been widely promoted, with the help of an operating microscope, only the carious bone is removed, and the sound transmission system of the middle ear is preserved as much as possible (hearing-preserving operations). With the help of such microsurgical operations, in 75% of cases ear rehabilitation and hearing function are preserved at the same time.

These operations are technically complex and require good training: sanitation of the upper respiratory tract, washing of the drum cavity, restoration of the conduction of the auditory canal and etc.

If the child has hearing loss as a result of a chronic purulent process, then a radical operation on the common cavity of the ear is performed, and pathological processes: cholesteatoma, polyp, granulations, carious bone, damaged auditory ossicles are removed.

Such surgical intervention requires a good knowledge of the anatomy of the temporal bone, because the surgery is performed in a small area near the canal of the facial nerve, the labyrinth, the sigmoid sinus, and the midbrain cavity. In such a situation, an incision is made in the fold behind the ear, the soft tissues are successively separated, the sphincter is exposed, opened, and a cave is opened through the antrum with a drill or drill, then the posterior bony wall of the external auditory canal and the attic. side wall is removed. As a result, a common cavity consisting of the drum and the antral cavity is formed (hence the operation is called a common cavity).After removing the posterior bone wall after surgery, the horizontal ampulla of the semicircular canals, the horizontal part of the facial nerve

canal, the opening of the auditory canal, the tympanic cavity and the upper part of the antrum, the mastoid tumor cells the bony wall separating it from the sigmoid sinus is well visible.A wide passage is created by cutting the skin between the mastoid septum and the external auditory canal in the shape of a "T" or "I". These incisions later participate in the formation of the epidermis. The incision behind the ear is sutured after surgery, and the operative cavity is flushed through the external auditory canal.

At the first stage, the trepanated bone is covered with a thin layer of granulation, through which epidermization develops from plastic flaps of the back wall of the external auditory canal. This process takes a long time, several months.

The postoperative period in children is more complicated than in adults due to the high growth of granulation, the recurrence of infection through the auditory canal, the difficulty of dressing change, and the exacerbation of the process after infectious diseases.

In about 5-10%, the purulent process continues in the space after the operation, but intracerebral complications are not observed due to the release of good pus.

The disadvantage of the radical operation is a hearing loss of up to 30dB due to the removal of carious ossicles and remnants of the eardrum. But in severe carious processes, when conservative treatment is ineffective, surgery is used as a preventive measure for autogenous intracerebral complications.

Tympanoplasty. In the 50s of the last century, in case of chronic inflammation of the middle ear, it was suggested to perform reconstructive intervention in order to restore the function of the sound-conducting apparatus to a certain extent, not only by means of a general cavity operation.

These surgical procedures are performed with native and alloplastic tissues through the use of delicate instruments with the help of operating microscopes. Such hearing-improving surgical procedures are known as tympanoplasty.

The founder of tympanoplasty, A. Wulshtein, distinguishes 5 types of tympanoplasty according to the degree of damage caused by the inflammatory process or the operation of the sound transmission apparatus: the simplest is to eliminate the defect of the drum membrane (myringoplasty or tympanoplasty type I), the most complex is type V , the sound transmission system is completely damaged. Type V tympanoplasty is rarely used.

Of course, for tympanoplasty, the preservation of the activity of the receptor apparatus of the inner ear is considered a necessary condition.

Tympanoplasty is widely used in adults and is effective in 70% of cases.

Reactions to this operation vary. On the one hand, it limits the wide application of this operation:

- difficulties in testing auditory function at a young age;
- impossibility of checking hearing function during surgery due to anesthesia;
- rapid recurrence of allergies and lack of immune system, many childhood infections;
- anatomo-physiological characteristics of the auditory path, difficulties in determining its functional status and seeing the nasopharynx;
- specificity of microflora (staphylococcus, proteus predominance);
- exacerbation of cholesteatoma;
- complications of the postoperative period;

On the other hand, bilateral low hearing in a child causes defects in the development of speech, changes in the psyche, decrease in mental activity, difficulties in the process of studying, in getting into a relationship with peers. Therefore, tympanoplasty in children should be performed at the age of 8-10 in two stages, after the sanatsiion operation. At a younger age, tympanoplasty is indicated when the process and low hearing are bilateral.

Complications. Intracerebral complications may develop in chronic purulent otitis media. Such complications can also occur as a result of acute otitis media. In case of intracerebral complications, immediate surgical

treatment is required for sanation of the focus. Without surgery, despite active antibiotic therapy and other treatments, the child may die.

Tympanogenic labyrinthitisinflammation of the inner ear is accompanied by limited or diffuse inflammation of the peripheral part of the auditory and vestibular apparatus.

IBSoldatov (1980) divides labyrinthitis into the following forms according to the causes of origin, pathogenesis, clinical picture and distribution:

1. According to the etiological factor: a) non-specific; b) specific (tuberculosis, ulcer);

2. According to pathogenesis: a) tympanogenic (otogenic); b) meningogenic; c) hematogenous;

3. According to the duration and clinical signs: a) acute; b) chronic (obvious, hidden);

4. According to the spread of the inflammatory process: a) serous; b) purulent; c) necrotic.

Patients who have undergone reconstructive surgery and tympanoplasty often develop limited tympanogenic labyrinthitis. Tympanogenic labyrinthitis accounts for 1-2% of middle ear diseases and occurs in 3.8-4.2% of chronic otitis media with caries, cholesteatoma.

The microflora that causes acute and chronic diseases of the middle ear also serves as an etiological factor in labyrinthitis.

Pathogenesis. The immune status of the body is important in the pathogenesis of the disease. In acute or chronic otitis media, the circumference of the base of the ulna and the membrane of the Cochlea window swells, as a result of which its permeability increases, pathological changes characteristic of diffuse serous labyrinthitis (accumulation of serous fluid) develop in the labyrinth. In chronic purulent otitis media with bone erosion or cholesteatoma, the ampulla of the lateral semicircular canal is often damaged and a fistula is

formed at the base of the promontory and ulna. The area of the fistula is limited by granulation tissue, so this type of labyrinthitis is called limited labyrinthitis. In a mild form of limited labyrinthitis, the edge of the fistula is covered with connective tissue or ossified. In the severe stage of the disease, the inflammatory process spreads from the bone capsule to the membrane labyrinth, and the patient develops symptoms of chronic disseminated purulent labyrinthitis.

At the height of acute otitis media or chronic purulent otitis media, toxic substances diffuse into the perilymphatic space through the atrium or cochlea windows. In serous labyrinthitis, the pathologoanatomical picture is as follows; the endosteal layer of the bony labyrinth swells and thickens, blood vessels expand, their permeability increases, leukocytes appear in the perilymph. The process spreads to all spaces of the labyrinth. In a mild course of the disease, the process can be restored, and in a severe course, the intra-labyrinth pressure increases, the secondary tympanic membrane and the scrotum are torn, and the patient develops acute diffuse purulent labyrinthitis. In the severe course of the disease, the membrane labyrinth and neuroepithelial structures of the inner ear are eroded.

In chronic purulent otitis media with labyrinthine fistula, the granulation border prevents the infection from spreading to the perilymph. Sometimes this barrier breaks down and the infection spreads from the middle ear to the bony labyrinth. The patient develops chronic diffuse purulent labyrinthitis, the function of the membrane labyrinth and neuroepithelial structures decreases or disappears.

Labyrinthitis clinical symptoms are manifested by auditory and vestibular disorders. In the mixed form of serous labyrinthitis, the hearing ability of the patient decreases, mainly due to the disturbance of the sound reception apparatus and the influence or decrease in the function of the vestibular analyzer. When the purulent process of the middle ear is treated,

the evening of labyrinthitis is relieved, hearing and vestibular functions are restored in the patient.

Acute disseminated purulent labyrinthitis is more severe and can lead to the development of meningitis or brain abscess complications. The disease begins violently, the patient has signs of acute vestibular disorders - dizziness, balance disorders, autonomic disorders, spontaneous nystagmus. In a short time, auditory and vestibular analyzer receptors fail.

*Limited labyrinthitis*is common. The main sign of the disease is the positive fistula sign. Sometimes limited labyrinthitis turns into chronic diffuse purulent labyrinthitis. After purulent labyrinthitis, the patient has ear heaviness and vestibular disorders. In serous labyrinthitis, these activities are preserved. Observation of pressor nystagmus in chronic purulent otitis media, the cavity created during the surgical procedure is not covered by the epidermis, indicates a labyrinth fistula. When the labyrinth fistula is examined under a microscope, a soft structure covered with epidermis is visible at the level of the lateral semicircular canal. When the probe is inserted into this area, the patient feels dizzy.

Conservative and surgical treatment methods are used in the treatment of labyrinthitis. Conservative treatment measures help to reduce intra-labyrinthine pressure, to prevent the transformation of serous labyrinthitis into purulent labyrinthitis and the development of intracranial complications. The patient is prescribed dehydration, antibacterial and general therapy.

The method of surgical treatment consists in performing an antromastoidotomy or nodal surgery in the middle ear.

Surgery is performed after conservative treatment measures, that is, after the symptoms of vestibular disorder in the patient decrease (usually in 6-8 days of the disease).

In recent years, the tactics of semicircular canal fistula treatment have changed due to the development of the microsurgical method. The fistula canal is surgically cleaned, granulation tissue and resorbed bone fragments along the canal are removed under a microscope, and then closed with soft tissue or a graft. After the cut piece of connective tissue is separated, the resorbed bone tissue is removed using a sharp microspoon. A piece of tissue is removed from the wound area behind the ear, crushed and washed with an antibiotic solution, placed in the fistula channel, and the hole is tightly closed. The bone tissue around the fistula is treated and a pit is formed. Dry thoroughly with alcohol. After that, granulated bone fragments are placed in it and in the fistula crater with the help of a micro spoon and glued with the help of siacrine glue. At the end of the surgical procedure, pulsed ultrasound waves are applied to the site of the fistula (for 10-30 seconds), so that the bone-siacrine composition turns into a bone filling and tightly closes the fistula channel. Then a piece of connective tissue is placed in this place and closed with a piece of rubber, a plug soaked in petroleum jelly and penicillin is placed on the wound. After surgery, the patient should stay in bed for 3 days. On 2-3 days vestibular disorders disappear, on 5-6 days the plug is removed. The wound will heal in 12-15 days.

In diffuse serous labyrinthitis, mainly conservative treatment measures are carried out. When diffuse purulent labyrinthitis develops in a patient with acute otitis media, antromastoidotomy is performed, and in a patient with chronic otitis media, a radical surgical procedure is performed.

Due to strong antibiotic therapy, surgery is performed only in some cases (for example, in acute inflammation of the inner ear, sequestration of the labyrinth, and labyrinthogenic brain abscess). In labyrinthogenic meningitis, the changes detected during the middle ear surgery and the late period after the operation are taken into account. The promontorium oraali is opened during a cochlear labyrinthotomy surgery to drain the inner ear.

In order to prevent labyrinthitis, timely detection and proper treatment of purulent diseases of the middle ear, taking the patients under dispensary control should be carried out. Timely detection and treatment of limited labyrinthitis helps to preserve the functions of hearing and vestibular apparatus in the patient, to prevent purulent labyrinthitis; In 3-4 weeks, the acute symptoms of the disease subside, and after 5-6 weeks, surgery is performed. A patient with diffuse serous labyrinthitis is immediately admitted to the ENT department. In order to prevent purulent labyrinthitis and to preserve the hearing and vestibular functions, the middle ear is treated with trepanation of the middle ear. In purulent labyrinthitis, surgery is performed to prevent intracranial complications.

2.4 Otogenic complications.

Common causes of autogenic complications in inflammatory diseases of the middle ear.

In recent years, intracerebral complications have been widely discussed in the literature. There are false assumptions about their decrease. Such opinions are based on a number of circumstances.

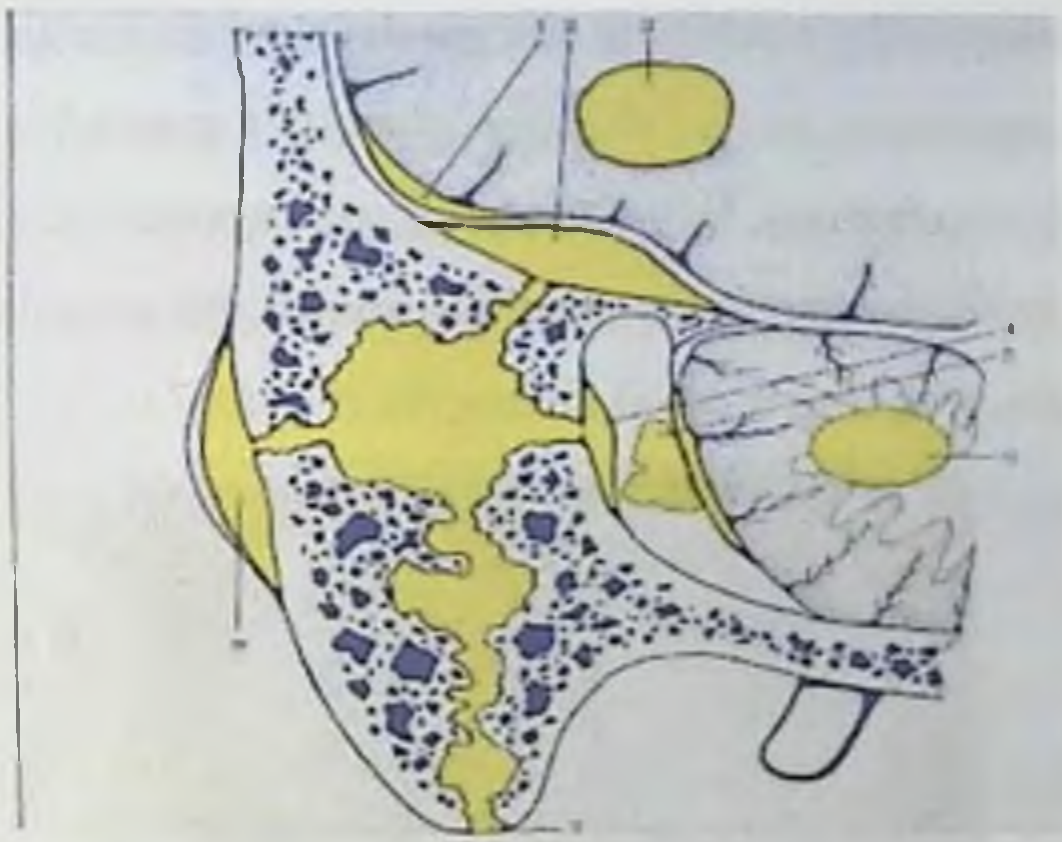
Currently, patients with intracerebral complications are admitted not to the ENT department, but to the resuscitation and neurosurgery department, and the latest generation antibiotics, hemosorption, plasmapheresis, UBI of blood and modern treatment methods are used.

In some cases, the process can be stopped at the stage of encephalitis or meningoencephalitis (before the abscess), serous meningitis (before the transition to the purulent process) or sigmoid sinus thrombosis (before the septic process) with the help of conservative treatment methods in such children.

Such patients are not considered cured, because the chronic purulent process remains in the ear, there is a risk of intracerebral complications, the mortality rate is 50-80%.

Complications of acute and chronic purulent otitis media in the area of the temporal bone (anthritis, mastoiditis, zygomatitis, facial nerve paralysis, limited and diffuse labyrinthitis), and deep brain (extra- and subdural abscesses, meningitis, sepsis, brain and cerebellar abscess) can spread to .(Picure 73).

The mechanism of development of complications, their danger, the choice of treatment tactics, the method, and the subsequent course differ sharply from each other in the acute and chronic process.



***Picure: 73. Autogenic complications**; 1-subperiosteal abscess, 2-epidural abscess, 3-intracerebral abscess, 4-perisinuos abscess, 5-sigma sinus thrombosis, 6-cerebral abscess, 7-mastoiditis, subperiosteal abscess*

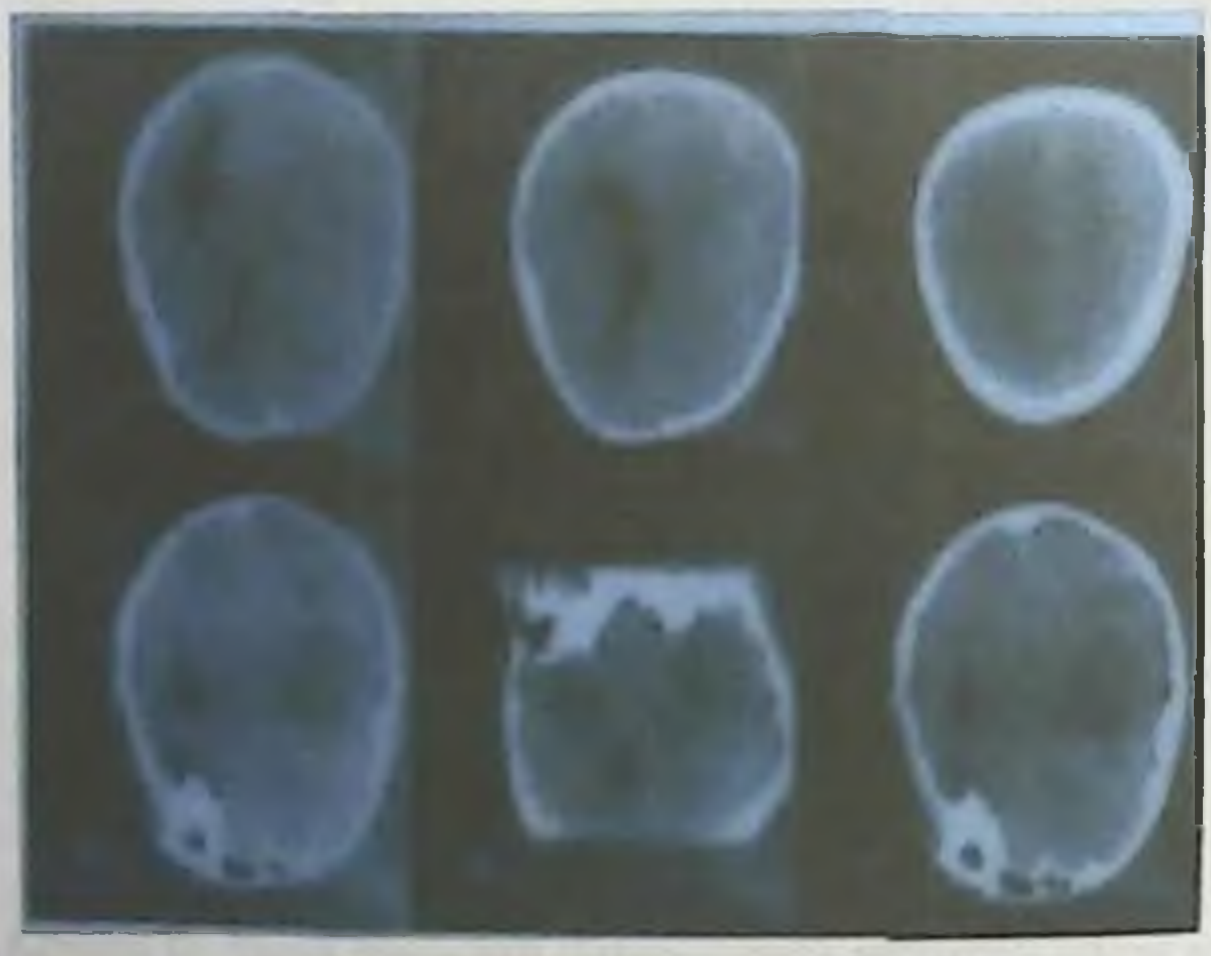
In acute purulent otitis media, the main route of spread of the inflammatory process is hematogenous, and in chronic otitis, it is contact or the duration of the process.

Epitympanitis often has complications, in such a situation damage to the upper wall (base) of the tympanic cavity or mastoid tumor occurs. The main place is occupied by cholesteatoma, it is included in the process in 32% of cases of opening of hard meninges in children, sigmoid sinus in 39%, bony horizontal wall of the semicircular canal in 20%, facial nerve in 9% of cases.

Such complications are less common in mesotympanitis. The ratio of complications in acute and chronic process is 1:3.

Ways of spread of the purulent process from the middle ear. Spreading of the process upwards, in the middle brain cavity. In such a situation, first of all, the drum cavity and the upper wall of the teat cave are damaged. In infancy and early childhood, desiccations in this area are preserved as a result of regrowth of the petrous-corneal fissure. The pus gets under the hard meninges and an extradural abscess occurs.

Subsequently, a subdural abscess develops as a result of the erosion of the hard meninges. In this situation, there is a possibility of spreading the process in two options. In the first, soft meninges are added to the purulent process, and leptomeningitis develops, sometimes spreading along the base of the brain, resulting in basal meningitis.(Picure: 74).



Picture: 74. Patient N. brain CT scan

In the second option, the process is deeper, spreads to the temporal part of the brain, encephalitis appears, then an abscess, damage to the top area is observed.

To some extent, these pathological processes are not isolated. Meningitis symptoms accompany the brain abscess clinic.

Back propagation of the process. In such a situation, purulent mastoiditis first occurs, and then the inner wall of the mammary tumor near the sigmoid sinus is eroded.

Since the sigmoid sinus is a duplicate of the hard meninges, like an extradural abscess, its frequent variant - a perisinusoidal abscess - appears here. Later, the sinus wall joins the process and phlebitis develops.

Inflammation of the blood vessel wall reduces venous blood flow in the sigmoid sinus, erythrocyte aggregation occurs, and sinus thrombosis is formed. At this stage of "red thrombus", emboli can fall into small blood vessels (lungs) or brain, that is, septicemia ("white thrombus") develops. In a number of cases, the thrombus becomes infected, spreads downwards through the jugular vein, and the dissemination of purulent emboli leads to the development of severe complications - septicemia.

Purulent thrombus can move from the sigmoid sinus inward (distal), into the brain.

In this case, the inner wall of the sigmoid sinus is eroded, and the purulent process spreads to the cerebral hemispheres near it, resulting in a cerebral abscess.

The process can sometimes move inward, medially, along the tympanic cavity. In this situation, the bony channel of the facial nerve, which first passes along the medial labyrinth wall of the drum cavity, is eroded. Pus or cholesteatoma presses on the facial nerve until it is destroyed, first paresis, then facial paralysis occurs.

The inward spread of the process can also cause the destruction of the horizontal ampulla of the semicircular canal of the labyrinth located on the inner wall of the drum cavity. Usually a punctate fistula is formed here,circumscribed labyrinthitisoccurs.

In some cases, the carious-purulent process does not stop there, on the contrary, it spreads to the entire labyrinth, resulting in diffuse purulent labyrinthitis. Because of its close proximity to the inner wall of the brain, its abscess cannot be ruled out. Such an abscess is called labyrinthogenic, in contrast to the sinusogenic abscess of the brain, which is formed in sinus thrombosis.

These severe complications are generalized by autogenous causes, so they are known as autogenous meningitis, autogenous abscess of the brain and cerebellum, autogenous sepsis, and hz.

In case of hearing loss due to infectious infection antibacterial therapy is carried out. Treatment of toxic forms of hearing loss involves detoxification. In the case of vascular genesis of hearing loss, vascular therapy is performed and - pentoxifylline (trental b), vinpocetine (cavinton), quinnarizine (stugeron), dihydroergocriptine + caffeine (vazobral) are used. Glucocorticoid therapy (systemic or local), hyperbaric oxygenation, etc. can be used.

In the chronic form of hearing loss, treatment is often ineffective. If it is impossible to improve hearing due to damage to the hearing apparatus, they turn to hearing aids - they choose an appropriate hearing aid, which enhances the perception of sounds or increases their permeability.

2.5 Non-purulent diseases of the ear

Adhesive otitis media- is a form of otitis media, characterized by the appearance of spikes in the tympanic cavity and a scar on the tympanic membrane.

Reasons.The disease is the result of incorrect diagnosis and treatment of acute otitis media. There are a number of objective reasons that lead to the development of adhesive otitis media. They include:

- violation of ventilation and drainage of the auditory tract;
- formation of exudate containing a lot of fibrin;
- allergic interstitial inflammation observed with edema of the mucous membrane of the drum cavity;
- low activity of leukocytic and enzymatic reaction of exudate;

- formation of granulation tissue;
- a remnant of myxoid tissue that serves to form a spike;
- food and gastric juice falling into the drum cavity during recording;
- hemorrhages on the mucous membrane as a result of changes in atmospheric pressure;
- trauma;
- unjustified treatment with antibiotics and hz;

Pathogenesis. Poor drainage of the auditory canal, absence of perforation of the eardrum or untimely paracentesis, as a result of treatment with antibiotics with bacteriostatic effect, symptoms of intoxication (increased body temperature, pain) disappear, vision Visible recovery is observed. If this situation is not detected in time, exudate is formed and fibrin fibers turn into spikes. Their location is different: the mirror of the bony labyrinth, the auditory ossicular system, or the tympanic membrane. As a result of this, sound transmission is disturbed, and permanent conductive hearing loss develops.

Clinic. The child's condition does not change, the otoscopic appearance remains unchanged, hearing loss and tinnitus can be detected. In such a situation, an active audiological diagnosis is necessary, because children do not complain of low hearing. After each case of acute otitis media experienced by the child, it is necessary to confirm that the hearing has returned to normal in a special institution.

Anamnesis. The history of acute otitis media, the presence of discharge from the ear, the use of antibiotics, and the status of hearing after the disease are important. Diseases of the throat, nose and paranasal sinuses, surgical procedures in the nasopharynx, barotrauma and HZ should be determined.

Otoscopy.The tympanic membrane is tense, the cone of light is reduced, short growth of the malleus, anterior and posterior folds are visible, sometimes white rashes-petrifications are visible on the tympanic membrane, thickened

parts with sail-like scars alternates, merges with the wall of the labyrinth in some places.

In otoscopy, the conditions described above are determined, the normal condition of the eardrum, if there is no movement in the auditory ossicular system due to antibiotic treatment, the normal condition of the eardrum does not rule out adhesive otitis media.

It is relatively important to check the mobility of the drum curtain with a pneumatic funnel. The tympanic membrane retains its mobility even in ankylosis of the auditory ossicles, but the limitation of its movements indicates a scarring process. A hearing test is essential.

Hearing test. Audiological examination shows damage to sound transmission. The adhesive process of the auditory ossicles is indicated by the high air conduction threshold, the parallelism of the curvatures of the bone and air conduction, and the high bone-air interval.

In case of obliteration of the bony labyrinth windows with a scar, it should be taken into account that hearing is reduced not only by air, but also by a violation of bone conduction, especially high tones are heard low.

X-rays in Schuller (cavern) and Mayer (attic) projections give some information about ear diseases in the form of reduced pneumatization of the tympanic cavity and mastoid tumor or its sclerosis. Scarring changes of the atticoantral area and enlargement of the cavernous sinus are detected.

Computed tomography increases the possibilities of examination, information is obtained about the condition of the auditory ossicles and even scar processes in the area of the bony labyrinth.

The cure. Treatment of adhesive otitis media can be conservative and surgical.

At the initial stage, cleaning of the ear with an air stream using the Politzer method, sending drugs to the ear drum cavity using a catheter, vibro- and pneumomassage of the eardrum, electrical treatment (galvanization and

faradization, blood vessel expansion, trophic and electrolyte effect-oriented pulse magnetotherapy) is effective.

These methods are used together with sending parenteral aloe, hormonal agents, enzymes.

Delivery of lidase to the tympanic cavity by tympanopuncture also works well. Transtympanal chymotrypsin and hyaluronidase are sometimes sent when there is persistent perforation of the tympanic membrane. In children, it is better to send these drugs using electrophoresis. This treatment method is used to absorb the scar and replace it with a relatively dense connective tissue. Of course, this method of treatment is not very effective for rough scars.

The method of surgical treatment in adhesive otitis media is very complicated. It is performed using an operating microscope and special equipment. Opening of the tympanic cavity causes trauma to the tympanic membrane due to scarring. Then the mechanism of sound transmission disorder is determined using optics. Scarring is usually detected in the auditory ossicular system, which is relatively removable. Relatively complex operations are performed when there are defects in the auditory ossicles or their parts. In most cases, the long growth of the femur is damaged, in such a situation, prosthetics is performed. Because granulation and re-scarring are observed in children, the result of a well-conducted operation also disappears, therefore, adhesive otitis media is not operated.

Otosclerosis.

Otosclerosis is one of the most common non-purulent diseases of the ear. The basis of the disease is a focal lesion in the bony capsule of the ear labyrinth. In 1877, Trelch introduced the term "sclerosis". But the author understood the ankylosis of the extension as a separate type of chronic catarrh of the middle ear. At that time, this disease was defined by changes in inflammation of the middle ear.

In 1893, Politzer, based on the comparison of clinical and pathologoanomic signs, concluded that this process is located in the bony cochlea of the inner ear and has nothing to do with inflammation of the middle ear. Therefore, he proposed to call this disease "otosclerosis".

Patients with otosclerosis have changes in the upper part of the temporal bone. In some places, dense bone is replaced by spongy bone, rich in newly formed vessels. More often, the process is located in the area of the anterior pole of the oval window, sometimes in the area of the round window, rarely it can spread to both areas of the window. The newly formed cancellous bone covers the annular ligament and longitudinal plate, resulting in ankylosis and immobility of this bone. This process can be called "otospongiosis".

There are histological and clinical stages of otosclerosis. The disease does not give a clinical appearance when the changes are located only in the bone. As the process moves to the circular ligament of the stapes (lig. annulare stapedis), the movement of the stapes is limited and sound transmission through the middle ear gradually deteriorates.

Until now, there is no consensus on the etiology, pathogenesis and nature of this process. There are many hypotheses about the causes of the development of the otosclerotic process in the pyramids of the temporal bone, which can be divided into 4 main groups (N.A. Preobrazhensky).

1. Assumptions about the development of otosclerosis as a result of the influence of mechanical and other physical factors.

2. Hypotheses about otosclerosis - or constitutional condition.

Z. Hypotheses about the causes of otosclerosis of internal gland dysfunction.

4. Otosclerosis - hypotheses about the symptoms of other diseases.

Otosclerosis occurs histologically in 10-17% of the population and clinically in 1-2%, according to the results of the examination of the temporal bone of a deceased person. In the middle part of "CIS" (Commonwealth of Independent States), 2.8% of deaf people and 0.2% of the general population have otosclerosis.

The clinical appearance of otosclerosis was described by Betsold at the end of the 18th century, but despite this, the diagnosis of otosclerosis in the mixed form causes great difficulties. Therefore, the anamnesis, results of otoscopy, results of examination of ear function, X-ray examination are of great importance in making a correct diagnosis.(Picure: 2.21).

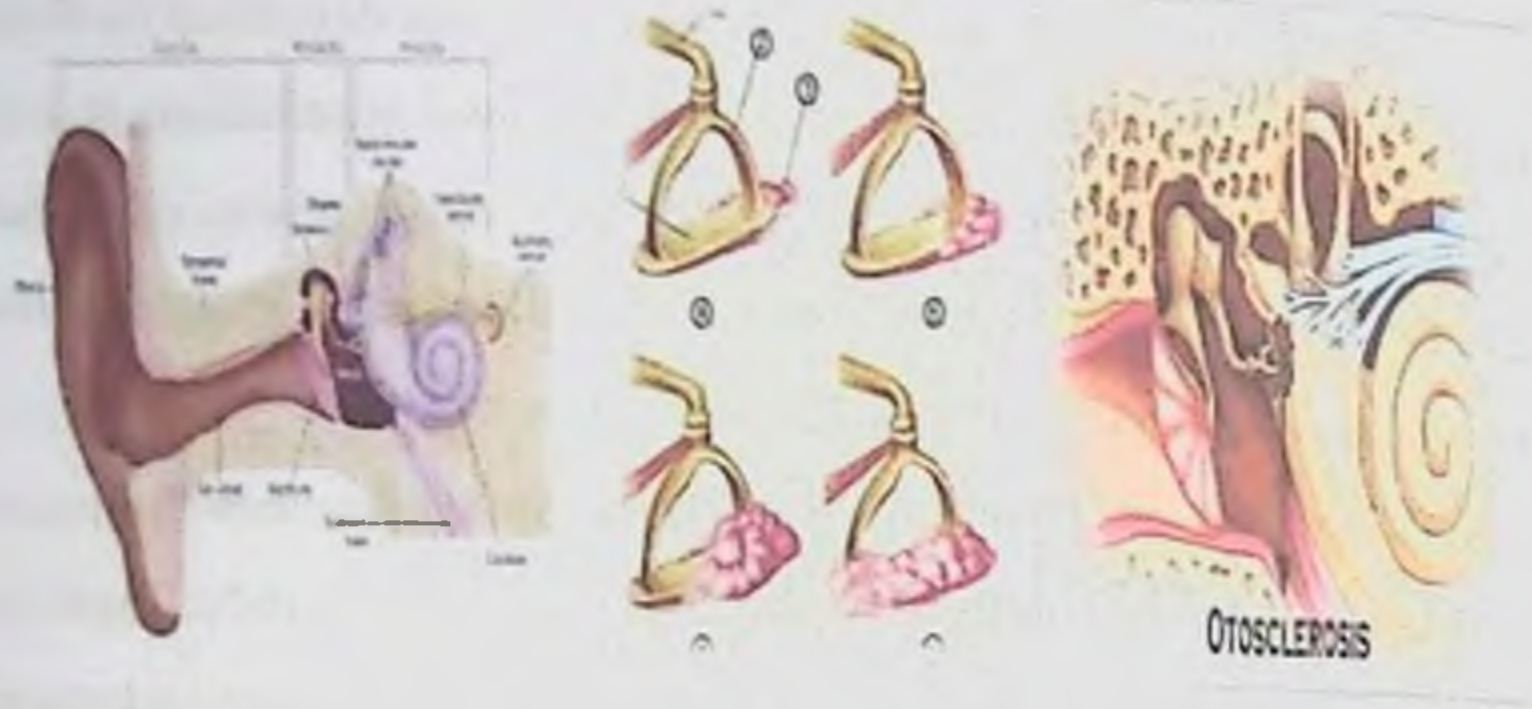
Ogosclerosis occurs most often in women between the ages of 20 and 40, and sometimes in children. The disease develops slowly, there are no obvious symptoms. Women consider it to appear after pregnancy and childbirth. Patients sometimes think that their illness is due to overexertion, inflammation of the middle ear as a result of infectious diseases.

Clinic.

At the beginning of the disease, there is noise in the ear, and then the ability to hear is reduced. Patients have a characteristic symptom of otosclerosis, i.e. the phenomenon of paracusis Willisii. In this case, patients' hearing improves in a noisy environment. In rare cases, deprecusis Scheer's phenomenon - that is, when the patient swallows and chews, the ability to distinguish speech decreases. Sometimes patients complain of dizziness, headache, memory loss in 40% of cases. The process is usually bilateral, lasts for years, but in some cases it increases rapidly.

Noise in the ear is noticeable at the beginning, but in the evening, when the environment is quiet. Shovkin is continuous, low volume, often leads the patient to despair. Usually, the time between the first and second ear damage can be a year or more, so patients complain of unilateral hearing loss.

The external auditory canal is wide, there is no ear canal, the skin of the auditory canal is easily damaged, and the cough reflex is not formed when tickled. There is no change in the veil, sometimes the back squares of the drawn part become redder. In the diagnosis of otosclerosis, it is important to examine the hearing function by whispering, speaking, using tuning forks and audiometry.



Picure: 75. *Otosclerosis*

During otosclerosis, there is a great difference between the reception of whispering and loud speech, and when testing with tuning forks, it is difficult to accept low-frequency tuning fork vibrations. Experiments about the difference in the transmission of sounds through air and bone when testing with tuning forks will definitely help. In this matter, the experiences of Rinne, Federich, Jelle, and Bing are significant. The experiments conducted by Weber are significant in terms of the consistency of the experimental results: when the sound-conducting apparatus is damaged, the lateralization of sound is transferred to the hearing ear. A threshold audiogram may show a curved line as sound travels through bone.

When the sound passes through the air, the curve of hearing is parallel to the curve of sound transmission through bone, depending on the degree of detection of the extension and the mobility of the secondary membrane of the cochlea. The normal threshold of hearing occurs in less than 50% of patients with bone conduction. In older people and when the disease is long-lasting, a decreasing or ring-to-ring audiogram with a bone-air interval of 40-60 dB is observed, and in young and middle-aged people, a sunken or sloping audiogram in the bone-air interval of 20-30 dB is seen. can reach

Neurosensory otosclerotic deafness normal conduction of the tympanic membrane in the threshold audiogram, high thresholds of hearing in bone conduction, normal detection of speech, normal reception of ultrasound,

recruitment if not, it is typical that the grades in the test are normal or slightly higher. Thus, otosclerosis is diagnosed based on the results of the anamnesis hearing test, otoscopy.(Picure: 76).

Treatment. Until now, despite the large number of conservative treatment methods, the treatment of patients with otosclerosis remains useless. Surgical treatment of patients with otosclerosis gives good results. In this case, the smooth passage of sound from the middle ear to the inner ear is restored. After surgery, in addition to improved hearing, the noise usually disappears. Surgery is not recommended when the bone-air gap is small. Cochlear reserve, that is, the bone-air interval, can be detected when it is equal to 25-30 dB. Stapedoplasty is considered one of the most recognized methods of examination at the moment.

Picure: 76. Stapedoplasty

Modern examination of the auditory ossicles (longitudinal) has great requirements: it is necessary to ensure that the sound vibrations pass well to the structure of the middle ear without damaging the protective membrane of the inner ear.

Among the complications, there is a violation of the function of the vestibular organ (located in the inner ear, which controls the balance of the head

and body): according to the data of many authors, neurosensory deafness is felt in 0.2–4 cases.

As a result of the improvement of methods, the complications of this disease are decreasing. Thus, in recent years, tympanal complications have decreased by 2 times, and labyrinthine complications by 5 times. Gradually, good results after surgery are 90%

Patients for whom surgery is not recommended should use a hearing aid, which improves hearing to the extent that the patient can fully communicate with others.

Ménière's disease

Ménière's disease- idiopathic hydrops of the labyrinth. The clinical symptoms of the disease were first written by the French scientist Prosper Ménière in 1861. (Picure 2.36)

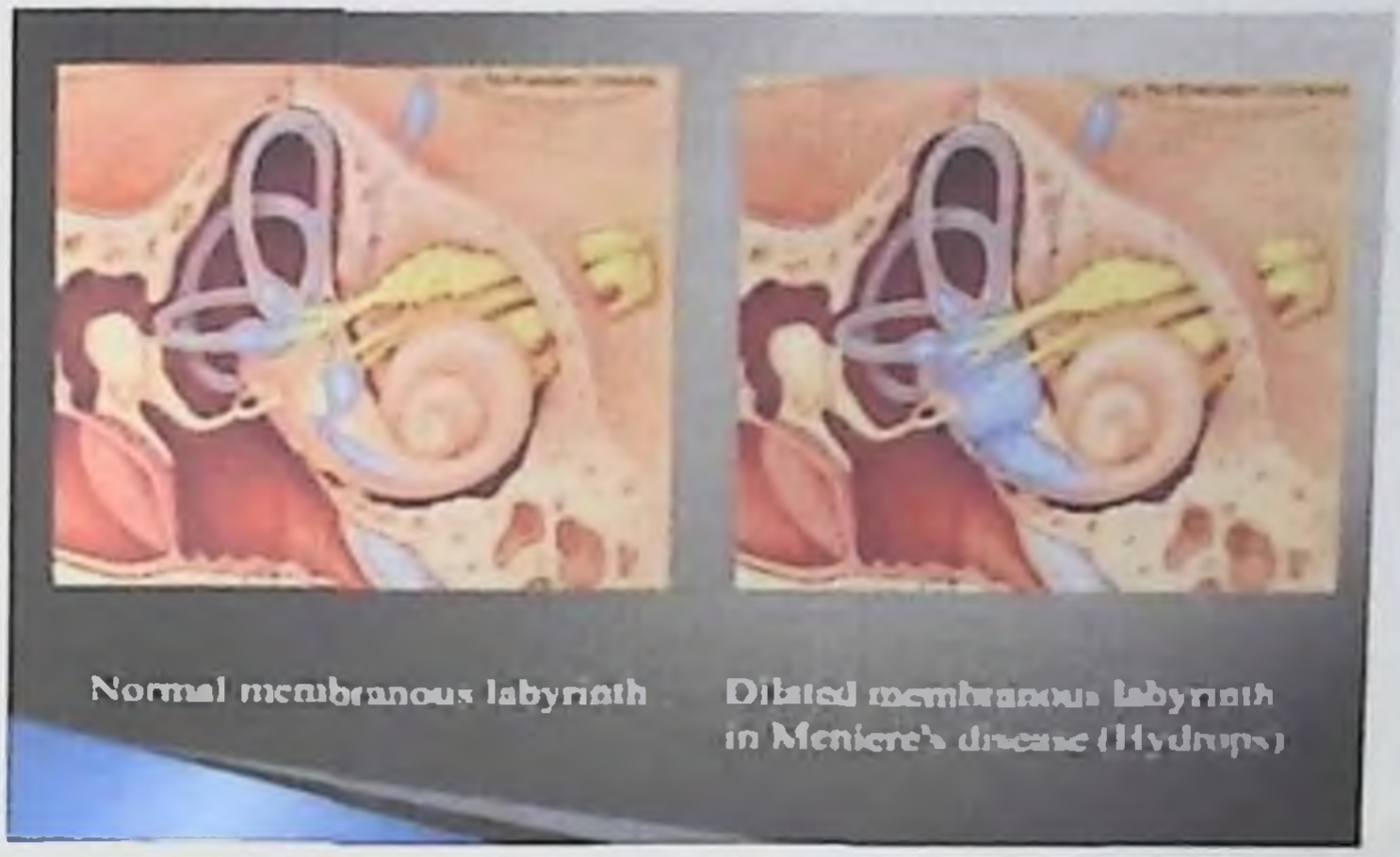
Etiology and pathogenesis. The cause of the disease has not yet been fully determined. As a result of the derailment of the mechanism of regulation of endolymph pressure in the labyrinth spaces, the pressure inside the membrane labyrinth increases (hydrops), which can be due to the following conditions:

1. Excessive production of endolymph through the vasculature.
2. Decreased endolymph reabsorption in the endolymphatic sac.
3. Violation of fluid circulation in endolymphatic channels.

The vascular factor is of leading importance:

- violation of vascular tone and vegetative innervation;
- violation of vascular wall permeability;
- violation of water-salt exchange.

An increase in pressure in the labyrinth disrupts the movement of sound waves towards the spiral organ, disrupts trophism and causes degenerative changes in the cells of the auditory vestibular analyzer.



Picure 77.*Ménière's disease:a - normal; b - Labyrinth in Ménière's disease:*

Clinic.Ménière's disease is one of the most common causes of dizziness. In most cases, one ear is affected, approximately 15% of patients are affected in both ears" In a young healthy person, sudden, unexplained dizziness, tinnitus, hearing loss, nausea, vomiting, indescribable discomfort and weakness; the patient's color is pale and the face is covered with sweat. Often the patient feels a sensation of swaying or falling, and when he falls, he becomes "numb" and cannot get up. Lying on his back when lying down, the patient is forced to close his eyes, because when he opens his arms, he feels the rotation of objects around him. Even the slightest movement of the head increases nausea and dizziness. When trying to change the position of the head, the patient has dizziness and vomiting signs are observed."

Meniere's disease often begins in the 20s and 50s, and the disease occurs equally in men and women. The disease goes in waves:

1. Prominent dizziness.
2. Balance disorders - the patient takes a horizontal position, tries not to move even his head, and has difficulty communicating.
3. Nystagmus.
4. Nausea and vomiting.

5. Hearing loss.
6. Noise in the ear (ringing, ringing, ringing).
7. Often loud sounds are perceived by the patient as a reflection - "sound double".
8. A feeling of exhaustion in the ear.

Stages of Ménière's disease:

I degree - the duration of the attack is up to 2 hours, it is repeated 1-2 times a year;

II degree - the duration of the attack is 2-5 hours and is repeated 1-2 times a month;

Level III - the duration of the attack is more than 5 hours, repeating 1-2 times a weekstands

After an attack, the patient becomes drowsy, feels heaviness in the head and loses the ability to work for 5-48 hours. Between attacks, the patient feels almost completely healthy. After an attack, hearing improves, but does not return to the previous level, that is, hearing worsens after each attack. Loud sounds are received by the patient as a reflection.

Inspection methods.

No changes are detected in otoscopy, the activity of the auditory tube is normal; at the beginning of the disease, hearing decreases in the conductive type, as time passes (due to necrosis of the hair cells of the organ of Kortiyev), it decreases in the perceptive type; Weber's test - sound lateralization to a healthy ear, Rinne's test - positive, Schwabach's test - reduced; Jelle test - negative; in the audiogram - a small bone-air gap appears when the bone conduction threshold is increased.

Treatment. During the attack, the patient is placed in a room free of noise and light, so that the vestibular symptoms are slightly reduced. A warm compress is applied to the patient's legs, and mustard is applied to the neck and back. From drugs, glucose 40%-20 ml v/i, pipolfen 2.5%-2 ml m/o, or

aminazine 1%-1.0 m/o, atropine 0.1%-1.0 ml t t/o, platifillin 0.2% - 2 ml, caffeine 10% - 1 ml t/o.

To reduce vertigo attacks, novocaine 1-2% - 1-2 ml (or trimecaine 0.5%), ml platyfillin 0.2% -0.5 or atropine 0.1% are administered sequentially through the meatotympanal route.

If both do not help, the patient is prescribed caffeine 10-20% -0.3-0.5 ml or trental 2% -1-2 ml.

After the attack, the patient is under the supervision of a doctor for a week. Repeating the treatment measures 2 times in 1 year in the initial period of the disease gives a good result.

A 5-7% solution of sodium bicarbonate is administered to the patient intravenously (120-150 ml for 15 days). It is recommended to use drugs that improve cardiovascular activity and relax together.

Rh: Caffeine sodium benzoate 0.015

Papaverine hydrochloride 0.02

Phenobarbital 0.05

Bromisovali 0.2

Calcii gluconatis 0.5

Mfpulv.Dtd 28

S. Drink 1 powder 2 times (at 1900 and 22 00) for 2 weeks.

In addition, the patient was given betaserk (16 mg 3 times for 12 days, 8 mg 3 times after subjective symptoms subsided), corinfarin (10 mg 3 times for 4-6 weeks), peritol (4-8 mg 3 times, for 3-4 weeks), bemithil (0.125 g 3 times for 5 days, every 2-3 days, 3 courses in total) drugs are recommended. All these are prescribed in the remission and initial periods of Ménière's disease. Treating the patient with recompression (barocamera) or hyperbaric oxygenation also gives a good result. The treatment lasts 45 minutes, a total

of 10 procedures are performed. The patient is forbidden to drink a lot of liquid, eat sharp and salty foods.

During the period of remission, treatment exercises are carried out, chronic tonsillitis, purulent sinusitis and other pathological foci are eliminated. In cases where conservative treatment measures did not help, surgery is performed. Surgical procedures used in Mener's disease are divided into 3 groups:

1. Surgical operations performed on the vegetative nervous system;
2. Decompression surgery performed in the labyrinth;
3. Destructive surgical operations performed on the labyrinth and vestibular nerve fibers.

Existing guidelines for conservative and surgical treatment in Mener's disease

Conservative treatment method;

1. Symptoms of cochleovestibular dysfunction.
2. In the initial period of the progressive course of the disease, reversible functional changes of hydrops and labyrinth receptors.
3. Combined with surgical treatment.

Instructions for surgical treatment;

1. Surgical operations performed on the tympanic nerve fibers (resection of the tympanic nerve fiber and tympanic node).
2. Decompression surgery.

a) in the endolymphatic bag:

- glycerol-test is positive, when the ability to hear is impaired, when the cochlea function is preserved;
- in order to prevent irreversible changes in the cochlea;
- II stage of surgical treatment when labyrinthine hydrops is preserved, after resection of nerve fibers of the tympanic cavity;

b) in atrial sacs (sacculo-and utriculotomy):

- hearing ability more than 50 dB, loss of 50% of speech, vestibular disorders with negative glycerol test

when the symptoms develop sharply, when the resection of the nerve fibers of the tympanic cavity is ineffective;

c) in the cochlea path (Cochlea fenestration and drainage):

-"b" group, only when tinnitus is also noted.

- when vestibular disorders develop sharply, when hearing loss exceeds 70dB, when the glycerol test is negative, and when the resection of the tympanic cavity nerve fibers is ineffective.

Thus, although many successes have been achieved in the detection and treatment of non-purulent diseases of the ear, measures to prevent them are still important. All patients diagnosed with ear pain should be under the supervision of a dispensary.

Picure 78. Surgical method in Ménière's disease. (labyrinthectomy).

Cochlear neuritis. Sensorineural hearing loss.

Hearing loss, hearing loss and deafness are of great social importance. If hearing loss in adults only limits their ability to communicate with others, sometimes impairs their ability to work, and in young children, due to hearing loss, speech formation and general development of the organism are disturbed. When the auditory nerves are inflamed, mainly in neurosensory disorders of hearing, deafness not only decreases, but tends to increase. Our leading otorhinolaryngologists believe that it is correct to call such a disease cochlear inflammation.

This group of diseases includes inflammations of degenerative atrophic changes of peripheral central parts of auditory analyzers. It is difficult to distinguish between dystrophic changes and inflammation-related changes from a clinical point of view. Peripheral diseases include inflammation of the auditory nerve along with damage to the cochlea, that is, degeneration of the auditory nerve can spread to the spinal cord and the fibers of the ossification plate (descending degeneration) or can spread from the center of the medulla to the cerebral cortex. .

According to literature data, neurosensory deafness is observed in 20-40% of patients with ear pain. Hearing loss, neurosensory defects are often observed in children.

Etiology of the disease. Auditory nerve fibers are very sensitive to exogenous influences, here heredity plays an important role. Scientists have developed a classification of the causes of neurosensory disorders of hearing (inflammation). According to this classification, inflammation of the auditory nerve can be hereditary, congenital, acquired, and independent without external causes. Usually, hearing loss is the first priority in such diseases, and sometimes vestibular apparatus diseases are also observed.

The frequent damage of auditory analyzer in inner ear inflammation and degenerative atrophic processes is mainly associated with the phylogenetic late development of the auditory analyzer compared to the vestibular analyzer.

Damage to the auditory nerve can be caused by various factors. Influenza and ARD (23%), skull injuries (12.2%), ototoxic antibiotics, drugs, chemical compounds (7.2%), vascular diseases (5.3), noise, mechanical vibrations of flexible bodies (vibration) neurosensory the main factors causing deafness are considered. 20.3% of patients have hearing impairment as a result of congenital or birth injury.

Pathogenesis. The main factor in the development of inflammation of the auditory nerve is the increased vascular permeability in the allergic state of the body. At the beginning of infectious inflammation, pathologoanatomical changes occur in the inflammatory reaction near nerve fibers and vessels: in the connective tissue surrounding them, a mixture of serous-fibrinous exudate with a large number, sometimes a small number of lymphocytes and neutrophils is observed.

In the process of severe inflammation, the nerve fibers are torn apart. As a result, the neuroepithelial spiral organ is involved in the degenerative atrophic process. As the auditory nerve fibers are very sensitive to endogenous and exogenous influences, they undergo a degenerative atrophic process associated with their replacement by connective tissue.

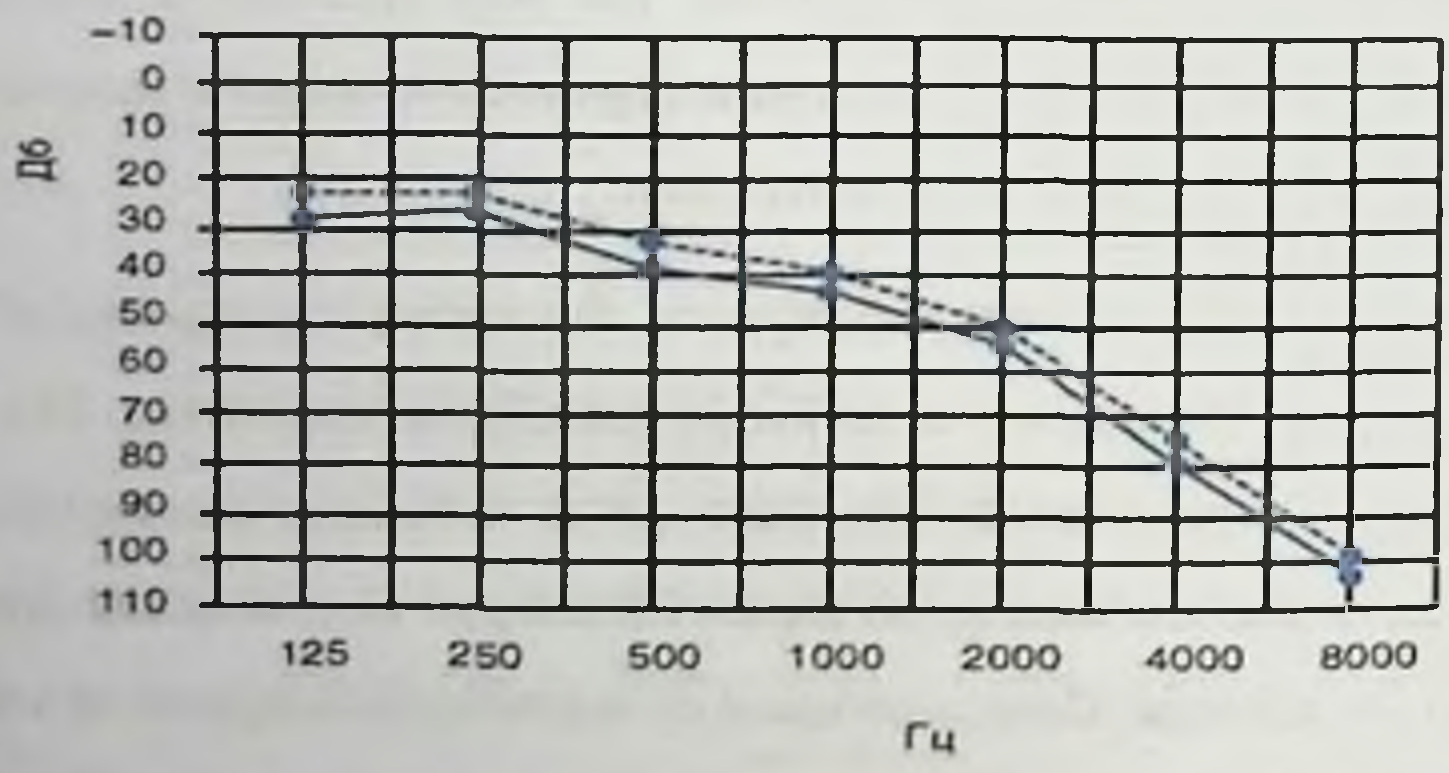
Individual sensitivity, changes in the body's immunological reactivity, general and local sensitivity to antibiotics are of great importance. The toxic effect of antibiotics depends on the lymphatic spaces of the inner ear and their long-term presence. Therefore, damage to the cochlear nerve fiber does not depend on the amount of antibiotic. Diagnosed based on the patient's complaint of a strong noise in the ear and hearing loss. Causes of inflammation of the auditory nerve fibers are determined based on carefully collected data in the anamnesis or some other medical documents (reference, outpatient card or extract from the medical history).

Further treatment depends on these reasons and how long the process lasts. It is basically a recovery process that can happen and is very important in the treatment of patients.

When seeing a patient for the first time, the main focus is on the patient's speech. Low speech is characteristic of patients with damage to the vocal cords. Nonacoustic speech, incorrect pronunciation of suffixes of words is the result of malfunction of the sound reception apparatus.

Noise in the ear due to inflammation of the auditory nerve is the result of inflammatory and degenerative processes, and sometimes, vascular dysfunction.

When the hearing ability is checked during the inflammatory process, the characteristic signs of damage to the sound-receiving apparatus are revealed, i.e., a weakening of the ability to receive loud sounds and a decrease in sound transmission through the bone. Sometimes the deafness starts over several hours or days, or develops quickly. In patients with inflammation of the auditory nerve, a descending conPicuration of the curved audiogram with partial or total absence of the bone-air gap is observed.(Picure: 79).



Picure: 79.Audiogram of hearing loss

In the acute stages, along with hearing impairment, symptoms of the vestibular analyzer can be observed, i.e. dizziness, imbalance, and involuntary nystagmus may appear. But in slow-developing changes in the vestibular

apparatus, the patient may not feel any vestibular disorder, but during the examination, a decrease in the excitability of the labyrinth is often observed. In particular, as a result of disturbances in the function of the sense organs that provide balance and posture, the patient often suffers from occasional dizziness.

Treatment. Treatment of neurosensory hearing loss is one of the most difficult areas of clinical audiology. The effectiveness of the treatment depends on the period of its initiation, how well the receiving receptors are preserved, and the degree of regeneration of the pathologically changed auditory analyzer cells. Because this is a serious matter, the treatment methods recommended by scientists do not always give good results.

The earlier the treatment is started, the more perfect the restoration of hearing. If acute sensorineural hearing loss is treated within 7 days of the onset of the disease, 41% of cases can be cured, and 25% of cases can achieve good results.

Despite the causes of neurosensory hearing loss, the main mechanism of their origin is considered to be the Cochleamicrocirculation disorder and oxygen deficiency. For this reason, the treatment should be carried out in a complex manner, directed to a certain goal.

In treatment measures, it is appropriate to use means that improve the condition of the inner ear and cerebral blood vessel walls and improve blood circulation. For this purpose, drugs that expand blood vessels are recommended: papaverine, dibazol, nicotinic acid, nicoshpan, nicotinamide.

Currently, cavinton, trental, stugeron, aminalon, cinnarizine are widely used to expand cerebral blood vessels, increase blood circulation, and improve oxygenation of brain tissues and skull. In particular, complamin and stugeron dilate peripheral and central blood vessels, soften venous blood circulation, have antihistamine and sedative effects, improve oxygen supply of brain tissue and glucose saturation.Glucose, hemodez, mannitol, neocompensan, reopoliglyukin, serum albumin, unitiol, urotropin are used for complex treatment.Trental and heparin are recommended to improve the rheological properties of blood.

In the treatment of neurosensory hearing loss, hyposensitization measures are carried out with antihistamine drugs and corticosteroid hormones.

In the complex treatment of neurosensory deafness, ATF, vitamins of group V, vitamin E, biogenic stimulants have a good effect on improving tissue metabolism and increasing the energy balance of the inner ear. ATF gives good results when administered intramuscularly and intra-arterially.

Some scientists describe the benefits of igloreflexotherapy in reducing noise and improving hearing as very great. Some scientists did not observe improvement of hearing in igloreflexotherapy.

In the complex treatment of neurosensory hearing loss, electrophysical exposure, including non-invasive electrostimulation, electrostimulation combined with medicinal (polykatan) electrophoresis has achieved high results. In the complex treatment of cochlear neuritis, the use of endaural phonophoresis and phonoelectrophoresis is proposed.

In recent years, scientists have emphasized the effectiveness of using Vasobral or Betaserk for the treatment of neurosensory hearing loss caused by vertebrobasilar vascular insufficiency and noise reduction.

In patients with neurosensory hearing loss, quantum chemotherapy, the effect of laser light on the spiral organ has been scientifically studied in experiments. In addition, the use of tanakan (Ginkgo-biloba extract) or the combined use of Ginkgo-biloba extract and laser therapy plasmaphoresis and blood irradiation with ultraviolet rays have shown good results in the treatment of neurosensory hearing loss.

Cochlear implantation, which is one of the modern achievements of medicine, has been proposed by foreign scientists and is widely used in practice and gives universal results.

In the initial stages of neuroepithelial inflammation, the degenerative process is in a decaying state, and the changes have the characteristic of functional return. The use of hyperbaric oxygenation (GBO) method gives positive results mainly during this period. Hyperbaric oxygenation moderates aerobic metabolism in the

auditory labyrinth, leading to hearing recovery in 70% of cases. In the complex treatment of neurosensory hearing loss, hyperbaric oxygenation not only removes hypoxia, but also has been proven to have a positive effect on mitochondrial intracellular regeneration and the receptor apparatus of the spiral organ.

According to data, 15% of oxygen passes from the middle ear to the perilymph of the conch Cochlea membrane and feeds the spiral organ.Therefore, it is desirable to improve the aeration of the tympanic cavity in neurosensory hearing loss.

Complex treatment measures for neurosensory hearing loss are carried out at least 3 times a year:

GBO sessions for children are held at a pressure of 1.4 atmospheres for 40 minutes. Young children are placed in the barochamber with their mothers during GBO sessions. During the course of treatment, the first test session is held for 20 minutes at a pressure of 1.4 atmospheres. The course of treatment consists of 7-10 sessions;

- Ferrum sulfate as anti-anemic drugs - 0.2 (4 mg/kg of iron per day), 1/2 tablet for 1-7 years, 1 tablet 3 times a day for 7-15 years. The course of treatment is 10 days;
- 30% as antioxidantsα-tocapherol acetate oily solution (up to 1-5 years, 5-10 mg/kg, parenterally 10-15 mg/kg per day for 5-15 years) and ascorutin 1/2 tablet 2 times for 1-5 years, 5-15 years 1 tablet 2 times a day. The course of treatment is 10 days;
- As a cerebral vasodilator and antihypoxant drug, oxybral is administered intravenously once a day in a physiological solution of 1.0 to 0.9%. The course of treatment is 10 days. The course of treatment is repeated every 4 months.
- All hearing-impaired patients should be placed in special kindergartens and schools after treatment, and hearing exercises should be conducted using hearing aids.

2.6 Deafness and hearing loss, changes in hearing

Hearing loss is such a decrease in hearing in both ears that there are difficulties in perceiving speech.

The main cause of hearing loss is chronic catarrhal and purulent otitis media, scarring processes in the drum cavity, otosclerosis, surgical interventions in the middle ear, as well as violation of sound conduction as a result of sensorineural hearing impairment.

Deafness*(surditas)*- this is a disease in which there is a complete lack of hearing or such a decrease in hearing, when oral speech is partially received only with the help of hearing aids. Deafness can be hereditary, congenital or acquired. The most common cause of congenital deafness is pathological heredity, pathological birth, pathology of pregnancy. Acquired deafness occurs as a result of the use of ototoxic drugs and infectious diseases (meningitis).

Deafness *(deafness)* It is called congenital or early childhood deafness, which leads to a lack of speech. Lack of speech is due to the inability of the child to learn to speak (muteness), because he does not hear either his parents' voice or his own. Due to this, deafness develops.

Special education of the deaf in special schools is of great importance for the successful upbringing and education of children with hearing impairment. An important part of schooling of the deaf and dumb is their professional training and employment.

Degrees and types of deafness

Hearing a live speech, in the speech zone (oscillation frequency 500, 1000, 2000, 4000 Hz), three levels of ear severity are distinguished according to the average indicator of hearing thresholds. Currently, the following classification of ear weights is used, which reflects a person's ability to communicate with others.

Degrees of ear severity

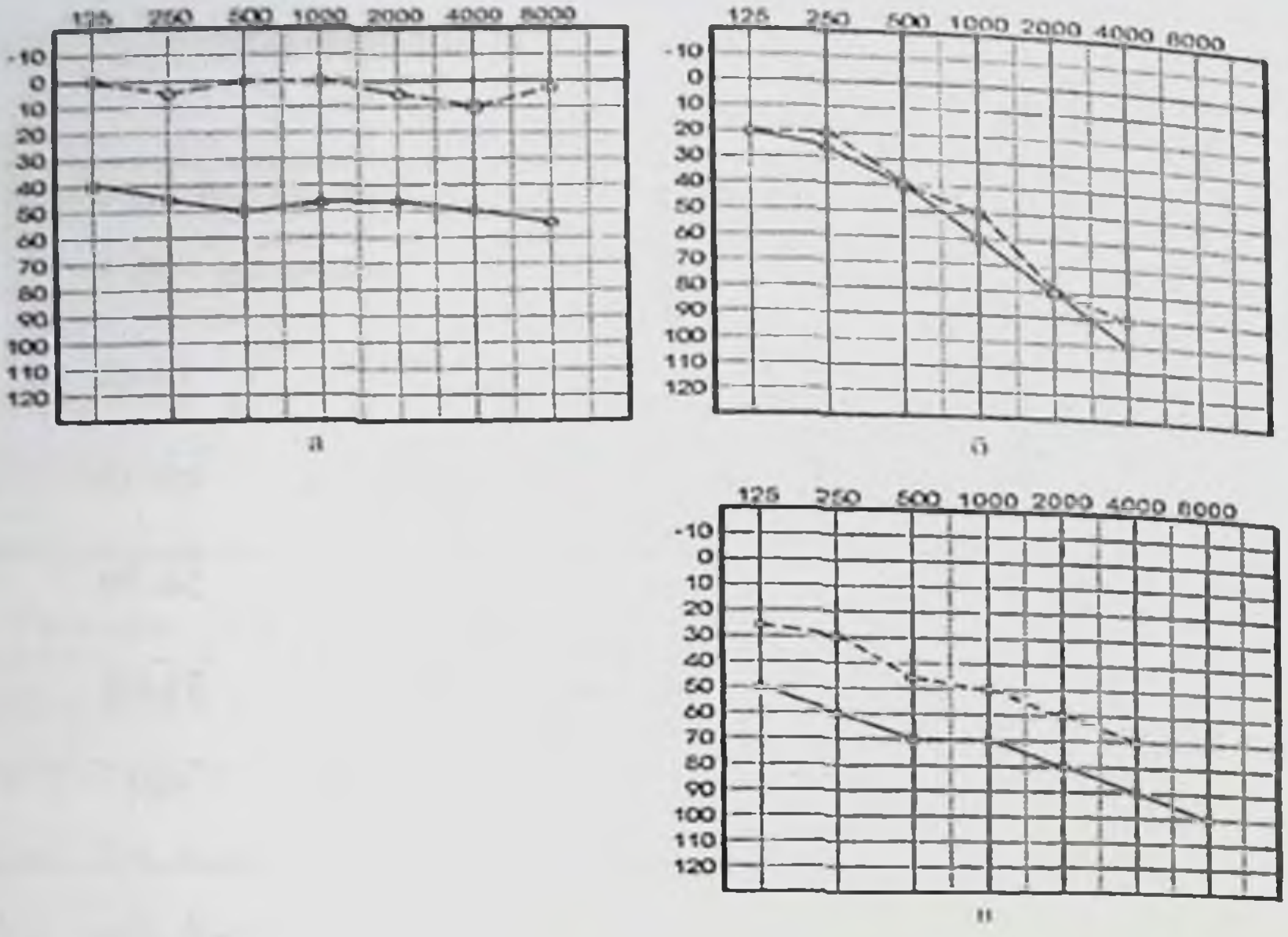
Degree of severity of the ear	Average hearing loss at speech frequencies (dB)
I	25-40
II	41-55
III	56-70
IV	71-90
Deafness	>91

At the I level of ear severity, the patient hears words from a distance of 6-4 m; At level II, the patient speaks words from a distance of 4-1 m; At level III - hears from a distance of 1m - 25 cm. Hearing loss beyond this is considered deafness.

Conductive hearing loss -observed when the sound transmission apparatus (external auditory canal, tympanic membrane and auditory ossicles) is damaged. Conductive ear heaviness develops in patients with otitis media, otosclerosis, otitis media, otitis media, eardrum injury, auditory ossicle deformity, cholesteatoma, and auditory tube conduction disorder.

Sensorineural hearing loss -It develops in case of cochlear receptor dysfunction or when impulse delivery to the central nervous system is disturbed and is observed in the following diseases: poisoning with ototoxic drugs, Meniere's disease, ear weight in the elderly, injuries of the inner ear and skull, wound, multiple sclerosis, diabetes.

Mixed hearing loss -occurs when the sound transmitting apparatus and the sound receiving apparatus are malfunctioning. For example, it can be observed in ear diseases.



Picure 80.*Audiogram of hearing loss a) Conductive hearing loss b) Neurosensory hearing loss c) Hearing loss of mixed type*

Hearing prosthesis and cochlear implantation

Hearing prosthetics - improving hearing with the help of a hearing aid.

Instructions for the use of hearing aids - this is important in the II-III degree of bilateral hearing loss. With an increase in the thresholds of speech frequency perception by 40 dB or more, a hearing aid that amplifies external sounds is selected separately for the patient.

Hearing aids are electro-acoustic devices designed to receive sound signals, convert them, amplify them and deliver them to the human ear (Pic. 81). The audiologist selects the device individually in special hearing aids. Different types of hearing aids are used: behind-the-ear, pocket and ear-shaped devices. (Pic. 82). The effectiveness of hearing aids is highly dependent on the technical excellence of the hearing aids.

Picture. 81.*Types of hearing aids*

Picure: 82.*Behind the ear hearing aid*

In recent decades, a new method of auditory rehabilitation of patients with severe hearing loss and deafness, with cochlear implantation, has been developed and is increasingly being used in practice. Cochlear implantation is a surgical method of cochlear prosthesis to restore lost hearing function.

The cochlear implant consists of an external and an implantable part (Pic. 83). External is a microphone, a speech processor and a transmitter. The implantable part includes a receiver and a set of electrodes (up to 22). The receiver is placed under the skin in a recess made in the temporal bone, and a set of electrodes is inserted into the drum stair of the cochlea through the opening of the cochlea next to its window to a depth of 30 mm.

Picure 83.*Cochlear implant: 1, 2 - transmitter; 3 - microphone; 4 - speech processor;*

5, 6 - receiver; 7 - electrode

Processing and coding of audio data is done using different coding methods. After cochlear implantation, some patients quickly begin to receive live speech, but many require long training with a speech therapist.

2.7. Ear tumors

Safe ear tumors

Among benign tumors of the external ear, papilloma, which is a tumor of epithelial origin, is relatively rare in nature. Papillomas are usually located on the skin of the external auditory canal and the auricle. Papilloma grows slowly, rarely reaching large sizes.

Treatment - surgical removal of the tumor.

Osteoma is a benign tumor formed from the compact layer of bone of the external auditory canal. Osteoma has a wide flat base and partially or completely covers the external auditory canal. Endophytic growth of osteoma is observed in the thickness of the mastoid tumor.

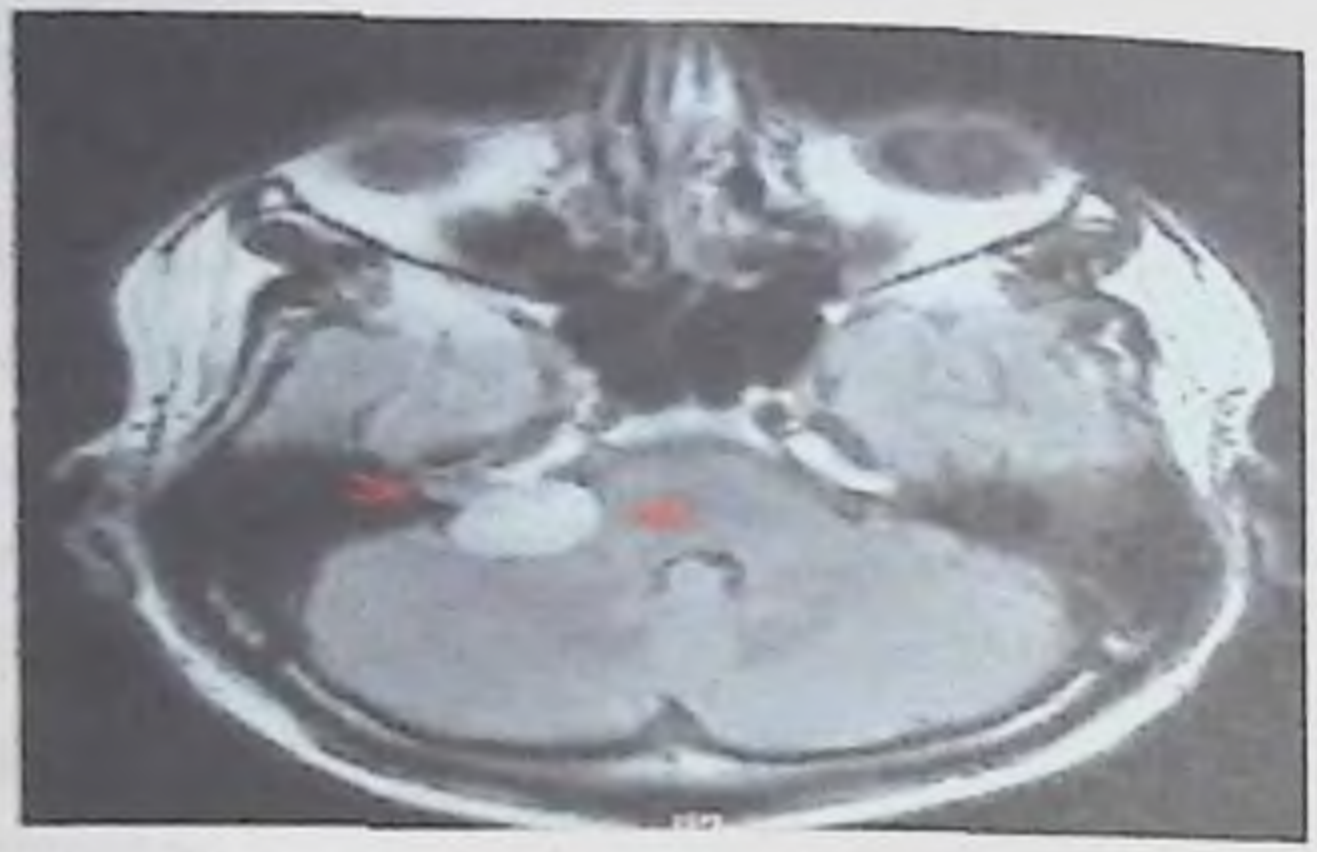
Treatment of osteoma is carried out by surgical removal of the tumor.

Hemodectoma (glomus tumor) is a benign tumor of the middle ear that develops from glomus bodies located in the mucous membrane of the

tympanic cavity and from the adventitia of the bulb of the internal jugular vein. Hemodectoma (Pic. 84). manifested by pulsating noise in the ear and hearing loss. As the hemodectoma grows, it gradually fills the middle ear and shines through the eardrum, then grows into the external auditory canal in the form of a red polyp. The tumor can destroy the bony walls of the drum cavity and spread to the bottom of the skull or even grow into the cranial cavity. A CT scan of the temporal bones or an MRI of the skull is required for diagnosis. Treatment - surgery, removal of hemodectoma. The extent of surgery depends on the size of the tumor, from tympanotomy to radical ear surgery.

Picure: 84.Hemodectoma of the ear

Corridor - sciatica nerve (VIII) neurinoma is a benign tumor arising from the Schwann sheath of a nerve, which usually has a capsule and therefore compresses the surrounding tissue. In the later stages, neurinoma reaches a large size and causes severe complications of the brain. An early sign of neurinoma is a gradual unilateral hearing loss that progresses to deafness. Hearing loss sometimes develops without being noticed by the patient and is discovered accidentally. In such cases, unilateral sensorineural hearing loss is often diagnosed. CT or MRI of the brain should be performed in all cases of unilateral sensorineural hearing loss (Pic. 85).



Picure: 85.*Magnetic resonance imaging of the brain with a neuroma of the VIIIth nerve (the tumor is indicated by arrows)*

Treatment of neurinoma is carried out by surgery and is performed by a neurosurgeon and, as a rule, leads to recovery.

Ear tumors of poor quality

Among malignant tumors of the external ear, squamous or basal cell cancer is more common. At the initial stage, a small crusted wound is formed. It is more difficult to detect a malignant tumor in the auditory tube. Sometimes, the first symptom is hearing loss due to blockage of the external auditory tube, then purulent discharge from the ear appears, often mixed with blood (Pic. 86). The diagnosis is determined after biopsy and histological examination.

Malignant tumors of the middle ear are rare, the most common types are cancer and sarcoma. On otoscopy, in most patients, the tumor resembles granulations or polyps. X-ray and CT scan of the skull allow to determine the boundaries of the process, and the final diagnosis is established on the basis of histological examination.

Picture. 86.External auditory canal

Treatment of patients with malignant tumors of the external ear - surgical and radiological, as well as their combination. Tumors in the middle ear require radical surgery, the degree of which depends on the spread and size of the tumor. Surgical treatment can be combined with radiologic.

Independent work questions:

1. Anomalies of the ear
2. Anatomy and diseases of the facial nerve
3. Nystagmus and its types
4. Ménière's disease and modern treatment methods
5. Cochlear implantation
6. Disequilibrium and unig types
7. Ewald's laws

TEST QUESTIONS

The inner ear is supplied with blood by branches

internal carotid artery

external carotid artery

*vertebral artery

internal cerebral artery

Indicate the sections that make up the inner ear.

* Cochlea semicircular canals vestibule

vestibule

tympanic cavity

semicircular channels

Which of the following does not apply to the inner ear

Cochlea vestibule semicircular canals

vestibule

*tympanic cavity

semicircular channels

The main treatment for children under 5 years of age with sensorineural hearing loss for speech development

*purpose of hearing aid

surgical treatment

regular blowing of the auditory tubes

tympanoplasty

What type of hearing loss occurs in patients with mixed otosclerosis?

conductive (sound conduction disorder)

perceptual (damage to sound perception)

*mixed

air presenter

Pure-tone audiogram in patients with sensorineural hearing loss

*decrease in both air and bone conduction curves, in the absence of an air-bone interval;

air bone interval and Carhart niche on the bone conduction hearing threshold curve;

small air bone gap with increased hearing thresholds by bone conduction

increased air conductivity

Which of the following causes plays the greatest role in the development of sensorineural hearing loss?

inflammation of the facial nerve

*violation of oxygen saturation of the labyrinth fluids and blood supply to the mucous membrane of the inner ear

obstruction of the auditory tube

inflammation of the external auditory canal

Which of the following diseases occurs when treated with ototoxic drugs?

*sensorineural hearing loss

otosclerosis

Ménière's disease

labyrinthitis

Which of the following diseases occurs due to poisoning with heavy metal salts?

*sensorineural hearing loss

otosclerosis

Ménière's disease

labyrinthitis

Which of the following diseases occurs when working in a noisy environment?

*sensorineural hearing loss

otosclerosis

Ménière's disease

labyrinthitis

Which of the following diseases occurs with diabetes?

otosclerosis

*sensorineural hearing loss

Ménière's disease

labyrinthitis

Weber's experiment in patients with sensorineural hearing loss

*lateralization of the tuning fork sound to the healthy ear

lateralization of the tuning fork sound to the sore ear

positive

negative

Rine's experience in patients with unilateral sensorineural hearing loss

lateralization of the tuning fork sound to the sore ear

lateralization of tuning fork sound to the healthy ear

*small positive;

negative;

What disease is most characterized by sudden disturbances in the body's balance and tinitus?

A. sensorineural hearing loss

B.otosclerosis

*C. Meniere's disease

D.labyrinthitis

What disease is characterized by a symptom of a patient's distorted perception of vowel sounds - "splitting of sound"

*A. Meniere's disease

B.otosclerosis

C. sensorineural hearing loss

D.labyrinthitis

Audiogram in patients with Meniere's disease

air bone interval, Carhart niche on the bone conduction hearing threshold curve;

absence of air bone gap;

*small air-bone gap with increased hearing thresholds by bone conduction

increased air conductivity

Meniere's disease most often develops against the background of

liver diseases

*hypertension, vegetative-vascular dystonia and menopause

vegetative-vascular dystonia and menopause

climax

What disease is most characterized by dizziness and tinitus?

chronic sensorineural hearing loss

otosclerosis

*Meniere's disease

labyrinthitis

Why does hearing loss occur in patients with otosclerosis?

*resulting in ankylosis of the stapes

as a result, sclerosis of the vessels of the middle ear

as a result of the appearance of fluid in the middle ear

as a result of hair cell dystrophy, curls

What disease is characterized by improved perception of sounds in noisy environments?

*A.otosclerosis

B. Meniere's disease

C. sensorineural hearing loss

D.labyrinthitis

What type of hearing loss occurs in patients with tympanic otosclerosis?

*A.conductive (damage to sound conduction)

B.perceptual (damage to sound perception)

C.mixed

D.air leading

Where is the organ of Corti located?

*in a membranous cochlea

in the bony cochlea

in the middle ear

in the mastoid process

Which of the listed anatomical structures belong to the vestibular analyzer?

Snail vestibule

*semicircular canals vestibule

vestibule

lattice labyrinth

Which of the following drugs is ototoxic?

*furosemide

veroshpiron

tetracycline

heparin

The otolith analyzer is located in

snail

semicircular canals
*on the threshold
lattice labyrinth

Which of the following does not apply to the inner ear
Cochlea vestibule semicircular canals
vestibule
*tympanic cavity
semicircular channels

SITUATIN TASK

A 24-year-old female patient complains of decreased hearing and tinnitus. She notes that her hearing improves in a noisy environment. She has been ill for 2 years. Her hearing has sharply decreased due to pregnancy and childbirth. During otoscopy, the external auditory canals are wide, there is no sulfur, the eardrums are thinned. Pink spots are visible through them. The patient can hear whispered speech at a distance of 2 m in each ear. There is no sound lateralization in the Weber experiment. The Rinne and Gelle experiments are negative. The Schwabach experiment is extended. Other ENT organs are normal. Problem establish a preliminary diagnosis.

Otosclerosis

Bilateral chronic catarrh of the middle ear.

Bilateral tympanosclerosis.

Bilateral chronic sensorineural hearing loss.

~Disease Meniere's .

A 30-year-old female patient complains of decreased hearing in both ears and tinnitus. These symptoms appeared 5 years ago after childbirth. Objectively, the eardrums of both ears are unchanged. Other ENT organs are normal. Hearing SHR - right ear 1m, left ear 1m. Rinne experience is negative on both sides. On the tonal audiogram, the bone-air gap is up to 40 dB with normal bone conduction in both ears. The task is to establish a diagnosis.

Otosclerosis

Bilateral chronic catarrh of the middle ear.

Bilateral chronic sensorineural hearing loss.

Bilateral acute sensorineural hearing loss.

Meniere's disease.

A 36-year-old female patient complains of dizziness, unconsciousness, nausea, vomiting, hearing loss and noise in the right ear. She has been ill for 3 years. Initially, such attacks recurred twice a year, in recent months the attacks have become more frequent and longer. The duration of attacks is 1-2 hours, the frequency of occurrence is twice a week. Objectively, spontaneous fine-swinging horizontal nystagmus is determined, directed to the right, in the Romberg pose there is a deviation to the left. The task is to establish a diagnosis.

Ménière's disease, right-sided lesion.

Right-sided chronic sensorineural hearing loss.
Exacerbation of right-sided chronic sensorineural hearing loss.
Otosclerosis, right-sided lesion.
Right-sided chronic catarrh of the middle ear.

A 56-year-old female patient complains of decreased hearing in both ears and constant tinnitus. Has been ill for 12 years. Worked at a cotton mill in conditions of high noise. Otoscopy and other ENT organs are unchanged. Hears whispered speech at a distance of 2 m in each ear. Hears high sounds worse. In Weber's experiment, there is no laterization of sound. Rinne's and Gelle's experiments are positive. Schwabach's experiment is shortened. The task is to establish a diagnosis.

Chronic bilateral sensorineural hearing loss.
Chronic bilateral catarrh of the middle ear.
Bilateral adhesive otitis media.
Otosclerosis
Tympanosclerosis

A 56-year-old female patient was admitted to the ENT department complaining of dizziness, unsteadiness when walking, and mucopurulent discharge from the right ear. She has been suffering from chronic otitis media for 20 years. Two days ago, the mucopurulent discharge from the right ear with an unpleasant odor increased, and dizziness and unsteadiness of gait appeared for the first time. Otoscopy data in the external auditory canal on the right show mucopurulent discharge with an unpleasant odor, the eardrum is pink with marginal perforation in the anterior-superior quadrant. A positive fistula test and horizontal fine-swinging nystagmus when looking to the right were revealed. When walking, the patient deviates to the left, and in the Romberg pose, the patient falls to the left. The task is to establish a preliminary diagnosis.

exacerbation of chronic purulent epitympanitis on the right, complicated by acute serous limited labyrinthitis
right-sided chronic purulent mesotempanitis complicated by limited labyrinthitis
right-sided chronic purulent epimesotympanitis complicated by limited labyrinthitis
right-sided adhesive otitis media
right-sided acute purulent otitis media

A 26-year-old patient came to the ENT office complaining that during a flight he had a feeling of congestion in his ears and hearing loss. After swallowing and yawning, his hearing was restored. Otoscopy - no pathological changes were found in the eardrums. The task is to explain the cause of this phenomenon?

Violation of the patency of the auditory tubes

Nasal obstruction

obstruction of the nasal part of the throat

obstruction of the auditory canal

obstruction of the oral part of the throat

A 42-year-old patient complained of decreased hearing in the left ear, noises in this ear that appeared after the flu he had suffered a week ago. Otoscopy: the left eardrum is normal. Hearing: whispered speech is heard with the left ear at the auricle. Tuning fork experiments: Rinne's experiment is positive, Schwabach's experiment is shortened, Weber's experiment determines lateralization of sound in the right ear. The tonal audiogram shows a descending nature of the bone and air conduction curves, an increase in the bone and air conduction thresholds by 40-60 dB mainly at high frequencies, there is no bone-air difference. The task is to establish a diagnosis.

Acute sensorineural hearing loss on the left.

Exacerbation of chronic sensorineural hearing loss on the left.

disease, left-sided lesions.

Acute catarrh of the middle ear on the left

Left-sided adhesive otitis media.

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ACUTE AND CHRONIC EAR DISEASES

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