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CLINICAL AND INSTRUMENTAL CRITERIA FOR THE SELECTION OF PATIENTS FOR TYMPANOPLASTY

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Abstract. Chronic purulent otitis media is an important socio-economic problem of the state and its health care system. This is due to a significant proportion of complicated forms leading to disability and death of the disease, as well as the costs associated with disability of patients and expensive treatment requiring the training of highly qualified personnel. According to the World Health Organization (WHO), the global incidence of chronic purulent otitis media ranges from 65 to 330 million people, of which up to 60% (39 to 200 million) suffer from significant hearing impairment. Moreover, as a result of complications of chronic purulent otitis media, 28,000 people die annually.

Keywords: chronic purulent otitis media, ear drum, tympanoplasty.

Introduction. The risk of developing chronic purulent otitis media increases in children and adults with one or more of the following factors: multiple episodes of acute otitis media [4]; acute otitis media suffered in the first months of life [2]; transferred secretory otitis media [6].

Additional risk factors for the development of chronic purulent otitis media are a combination of common risk factors for acute otitis media, as well as factors related to socio-economic status and insufficient medical care [5]. These include: living in overcrowded conditions [3], including in a large family [1]; attending kindergarten [2]; low level of education of parents [7]; unbalanced diet with low levels of zinc, selenium, calcium and vitamin A [4]; active or passive smoking [2]; frequent upper respiratory tract infections [8]; infectious and chronic diseases such as measles, HIV infection, tuberculosis, diabetes mellitus and malignant neoplasms [1-4]; a number of background diseases such as cleft upper lip/palate, Down syndrome, hoan atresia and other craniofacial abnormalities [6,7].

It is also assumed that a genetic predisposition is also a risk factor. This is confirmed by the increased risk of developing chronic purulent otitis media observed in the Inuit of Alaska, Canada and Greenland, Australian Aborigines and some Native Americans [3], as well as numerous experimental genetic models in vivo [8].

Results. The loss of a significant part of the surface of the tympanic membrane can occur not only due to perforation, but also as a result of other pathological conditions that accompany chronic purulent otitis media. Such conditions include retraction pockets, multiple foci of myringosclerosis, epidermization of the inner surface of the eardrum, and others. These conditions may require resection of a certain part of the pathologically altered eardrum during surgery.

To characterize the forms of chronic purulent otitis media in patients included in the study and comparison groups, examples of the otoscopic picture are given as the primary and leading tool of the diagnostic algorithm that determines the prognosis and treatment tactics of the patient (Figures 1-4).

Figure 1 - Preoperative otoscopic picture in patient T. from subgroup 1.1 with subtotal perforation and foci of myringosclerosis in the remains of the tympanic membrane

Figure 2 - Preoperative otoscopic picture in patient C. from subgroup 4 with total perforation of the tympanic membrane

Figure 3 - Preoperative otoscopic picture in patient L. from subgroup 1.2. Multiple foci of myringosclerosis will lead to intraoperative loss of more than 50% of the surface of the tympanic membrane when they are removed

Figure 4 - Preoperative otoscopic picture in patient T. from subgroup 1.3 with total perforation of the tympanic membrane, epidermization of the facial pocket and superstructures of the stirrup

The results of computed tomography in the study and comparison groups made it possible to adjust the primary surgical tactics based on the estimated volume of involvement of temporal bone structures in the pathological process, which was undoubtedly important when discussing the volume of surgery with the patient. The

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greatest attention in patients for whom the possibility of preserving the posterior wall of the external auditory canal was considered was given to assessing the condition of the anterior epithympanal sinus and the cellular structure of the mastoid process – those areas whose condition cannot be reliably assessed by otomicroscopy.

In particular, the example shown in Figure 5: the anterior epithympanal sinus is filled with soft tissue density (cholesteatoma), air is visualized in some cells of the mastoid process, an air bubble (or an arcuate liquid level) is visualized in the cave of the mastoid process, air is around the anvil body from two sides. It is assumed that in this case, the upper fold of the malleus separating the anterior and posterior attic is the limiting boundary for the spread of cholesteatoma, thus, the clinical picture corresponds to a combination of selective disventilation syndromes of the lower and upper attic. Conclusion: a bone stage is planned according to the Stackke method, presumably no more than the volume of atticotomy, therefore it is possible to preserve the posterior wall of the external auditory canal, for adequate sanitation of the anterior epithympanal sinus, removal of the hammer and anvil is planned.

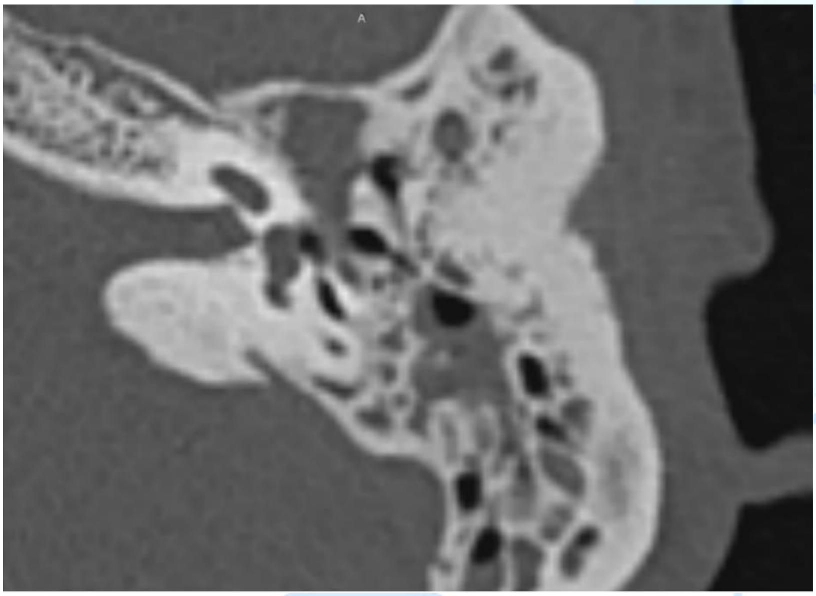

Figure 5 - Axial projection of the MSCT of the temporal bones of patient Z. at the level of the hammer head and the anvil body.

Another example in Figures 6-7: the anterior epithympanal sinus is pneumatized, the cave of the sclerosed mastoid process is also pneumatized, the tympanic membrane is deformed by a retraction pocket in contact with the cape of the medial wall of the tympanic cavity and the superstructures of the stirrup. This clinical picture corresponds to selective retrotimpanum disventilation syndrome. Conclusion: it is planned to remove the lateral wall of the facial pocket, with the possible removal of the pyramidal process, it is also planned to remove the anvil and hammer, it is possible to remove the superstructures of the stirrup. Atticotomy is not planned, it is possible to preserve the posterior wall of the external auditory canal.

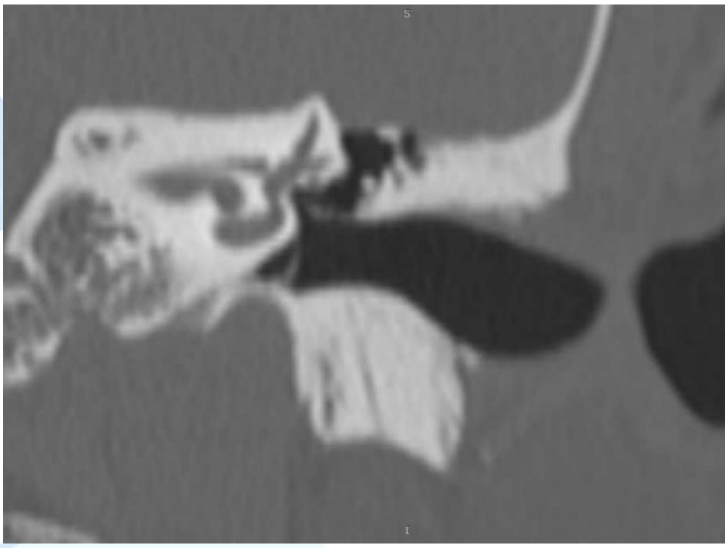

Figure 6 - Coronary projection of the MSCT of the temporal bones of the patient of the IG. at the level of the hammer head and the anvil body

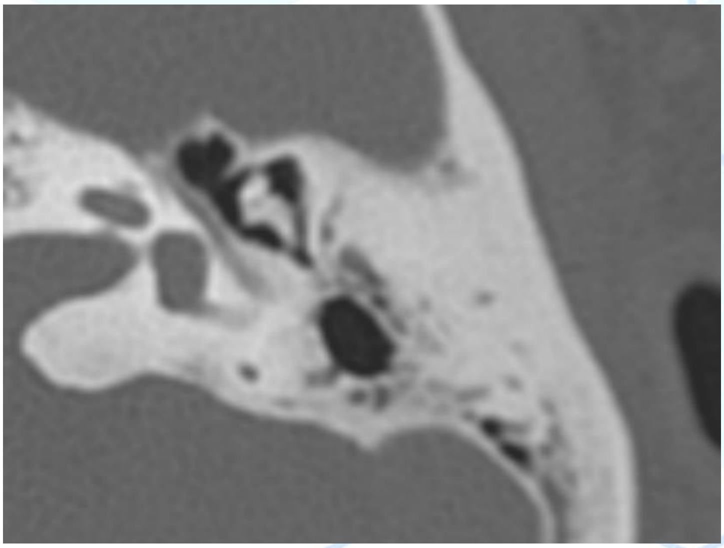

Figure 7 - Axial projection of the MSCT of the temporal bones of the patient of the IG. at the level of the hammer head and the anvil body.

The possibilities of virtual endoscopy in groups 1 and 4 were considered primarily in the context of evaluating the auditory ossicle chain. During three-dimensional reconstruction, computed tomography data with varying degrees of visualization quality made it possible to assess the condition of the auditory ossicles in a format convenient for perception. It was noted that the visualization quality was better when constructing models based on MSCT than on CBCT, which is due to the low signal-to-noise ratio when evaluating structures in the thickness of the temporal bone, despite the fact that the thickness of the slice in CBCT is significantly less.

Conclusion. One or another chosen surgical technique of the reconstructive stage of tympanoplasty determines the change in the coefficient: with an improvement in sound transmission at frequencies of 12.5 and 16 kHz, the coefficient in the total sample increases, with a deterioration in sound transmission at the same frequencies,

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the coefficient in the total sample decreases. To compare the functional result in groups 1 and 4 for air conduction (sound), bone-air interval and air-air interval, previously used nonparametric methods of statistical analysis (U-MU, H-KU), as well as a comparison of absolute values in assessing the dynamics of the coefficient.

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