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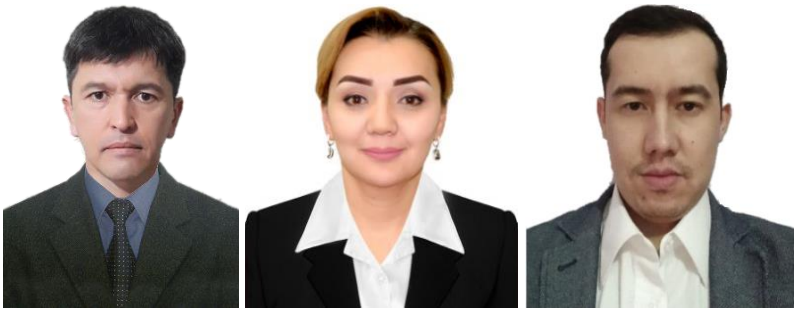
HEARING FACILITY OF PATIENTS WITH PERIPHERAL AND CENTRAL HEARING DISORDERS



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МАРКАЗИЙ ВА ПЕРИФЕРИК ЭШИТИШИ БУЗИЛИШИ БОР БЕМОРЛАРДА ЭШИТИШ ҚОБИЛИЯТИНИНГ МОСЛАШИШИ

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СЛУХОВАЯ ПРИСПОСОБЛЕННОСТЬ ПАЦИЕНТОВ С ПЕРИФЕРИЧЕСКИМ И ЦЕНТРАЛЬНЫМ НАРУШЕНИЕМ СЛУХОВОЙ ФУНКЦИИ

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Резюме. *Оддий эшитиш қобилиятига эга бўлган 79 та ва периферик ва марказий эшитиш қобилияти бузилган 328 беморда тескари мослашиш вақти (ТМВ) 2 дақиқали стимуляциядан кейин 2000 Гц оҳанг ва 60 дБ интенсивликдаги ешитиш чегарасидан бир хил частотада ўлчанди. Овозни қабул қилувчи аппаратнинг периферик шикастланиши бўлган беморларда ТМВ қиймати нормадан фарқ қилмаслиги кўрсатилган. Маҳаллий мия патологияси бўлган беморларда ТМВ мия пояси ва диенцефалик тузилмаларнинг шикастланиши билан, шунингдек, мавжуд патология ушбу тузилмаларга таъсир қилиши мумкин бўлган ҳолларда (мияча-куприк бурчаги) кескин ошганлиги аниқланди. Ушбу тест маҳаллий мия патологияларининг отоневрологик диагностикасининг умумий комплексида қўлланилиши таклиф этилади.*

Калит сўзлар*: сенсоневрал эшитиш қобилияти, аудиометрия, диенцефалик тузилмалар, мияча-куприк бурчаги.*

Abstract. *In 79 normally hearing and in 328 patients with peripheral and central hearing impairment, the reverse adaptation time (RAT) was measured after 2-minute stimulation with a tone of 2000 Hz and 60 dB intensity above the threshold of hearing at the same frequency. It was shown that in patients with peripheral lesions of the sound-receiving apparatus, the value of the RAT did not differ from the norm. It was found that in patients with local brain lesions, the RAT increased sharply with damage to the brain stem and diencephalic structures, as well as in cases where the existing lesion could affect these structures (cerebellopontine angle). This test is proposed to be used in the general complex of otoneurological diagnostics of local brain lesions.*

Key words*: sensorineural hearing loss, audiometry, diencephalic structures, cerebellopontine angle.*

Among the phenomena characterizing the auditory system. a special place is occupied by adaptation, a decrease in auditory sensitivity that occurs as a result of sound exposure [3,5]. In clinical practice, for the differential diagnosis of hearing loss, such parameters of auditory adaptation as the magnitude of the shift in the threshold of audibility, the recovery time of threshold sensitivity after a sound load are used [4,7,8]. Traditional treatment of various forms of sensorineural. hearing loss does not satisfy clinicians and is effective only at the acute onset of the disease, while the methods of electronic hearing prosthetics, with implantation of frequency-modeling stimulators into the cochlea, inspire certain hopes, but their results are still far from ideal [1,4]. All this indicates that treatment in almost all cases is at the late stages of the disease. And this is a consequence of the late diagnosis of the disease, primarily associated with the use of traditional methods of diagnosing hearing disorders, which by now already indicates insufficient methodological support for solving the existing problem and requires the development of fundamentally new approaches to the diagnosis of hearing disorders that would allow detecting the disease at the stage of development when the disorders are still reversible [2,5]. In recent years, there has been an active search

for new methods for studying peripheral and central mechanisms of sound analysis by frequency, intensity, duration, binaural interaction, which form the basis of high noise immunity of the auditory system in a wide frequency and dynamic hearing ranges. In most clinical studies of auditory adaptation, it was noted that the maximum adaptive changes were observed in patients with sensorineural hearing loss of the peripheral type. In contrast to these ideas, a number of psychoacoustic, psychopharmacological and electrophysiological studies have obtained data linking adaptation by processes occurring in the central parts of the nervous system [1,5,9]. In recent years, it has been repeatedly suggested that adaptation is related to the state of the central parts of the auditory analyzer [2,5,8,9].

The **purpose** of this study was undertaken to study the features of auditory adaptation in patients with lesions of various parts of the brain.

Materials and methods of research. The study was carried out on the audiometer AR-5 of the firm "Peterss (England). After recording a tonal audiogram to clarify the level of hearing damage, the patient was subjected to a comprehensive examination, which included the following tests: threshold adaptation, intensity increment index, duration effect, automatic audiometry, discomfort thresholds. In some patients, the phenomenon of lateralization was investigated by the method of A. Ya. Altman. Then the shift of the audibility threshold and the recovery time of threshold sensitivity (the time of reverse adaptation to BP) were determined by the method adopted in clinical audiometry. The audibility threshold was measured using the 5 dB boundary method, after which the subject was given a monaural sound load with a frequency of 1000 and 2000 Hz and 60 dB above the audibility threshold for 2 minutes, Repeated measurements of the audibility thresholds for a tone of the same frequency were made immediately after the termination of the sound load, the sound signal was given for 2-3 seconds at intervals of 2 s. The intensities of the presented signals were changed from smaller to larger and after reaching the audibility threshold in reverse order.

The magnitude of the shift of the audibility threshold was determined as the difference between the intensity of the first signal perceived after the sound load and the threshold intensity of the signal determined before the sound load, where the time elapsed from the moment of termination of the sound load to the restoration of the initial threshold of audibility was taken as the time of restoration of threshold sensitivity (RAT).

The study was conducted on 79 healthy subjects, 152 patients with sound conduction disorders and peripheral sound perception disorders and 97 patients with brain lesions. A total of 328 people, among the patients with brain lesions, 14 had a tumor and 83 had focal epilepsy. In addition to neurological, psychiatric, otoneurological and neuro-ophthalmological studies, electroencephalography was performed in all patients with brain lesions.

The results of the study. At the beginning of the study, RAT and threshold shift were determined in healthy individuals and in patients with peripheral hearing impairment, in the future, when analyzing the data, only the results of RAT measurement will be given, since when determining this parameter, differences between the studied groups of patients were revealed most clearly. It turned out that the average value of RAT in healthy individuals was 20.9 e, in patients with sensorineural hearing loss of peripheral type - 22 s, in patients with otosclerosis - 76.2 C. A significant increase in RAT was observed in patients with otosclerosis. These changes were noted by K. L. Khilov and N. A. Preobrazhensky and other researchers.

It should be emphasized that with sensorineural hearing loss, the RAT was short-lived and differed relatively little from the data in healthy people. Thus, the results obtained show that the pathological increase in RAT is not characteristic of peripheral lesions of the sound-receiving apparatus, in this regard, further studies of auditory adaptation were undertaken in patients with central lesions.

Table 1. RAT in patients with peripheral and central lesions of the auditory analyzer.

Examined groups	Recovery time, sec	Difference reliability	
		With norm P	With sensorineural hearing loss P
Healthy individuals	20,9± 2,4		
Sensorineural hearing loss	22,0± 1,8	>0,05	
Otosclerosis	76,2± 4,5	<0,05	
Temporal lobe tumor	21,9 ±1,9	>0,05	>0,05
Frontal lobe tumor	30,3± 1,1	>0,05	>0,05
Parietal lobe tumor	28,4 ±2,3	>0,05	>0,05
Defeat of diencephalic structures	83,5± 6,1	<0,05	<0,05
Arachnoiditis of cerebellopontine angle	73,2± 6,3	<0,05	<0,05
Brainstem defeat	62,3± 22,9	<0,05	<0,05

Table 1 shows the average values of RAT in patients with different localization of brain lesions. For comparison, the measurement results are presented in healthy people, in patients with otosclerosis and in patients with sensorineural hearing loss. Compared with the data in healthy individuals and in patients with sensorineural hearing loss, the most distinct increase in RAT was observed with lesions of the diencephalic structures, the cerebellar angle and the brainstem. The revealed differences were statistically significant. ($P< 0.05$)

For many years, the otorhinolaryngological literature has been dominated by the notion that auditory adaptation is a process directly related to the cochlea [2,8]. The authors mentioned between the magnitude and the accelerated increase in volume characteristic of the lesion of the hair cells of the spiral organ. Undoubtedly, in the group of patients with sensorineural hearing loss, researchers included patients with lesions of both the peripheral and central parts of the auditory analyzer, and this could not be otherwise, since the level of development of audiology did not allow for differential diagnosis of these forms of hearing loss,

Over the past decades, the research of domestic and foreign authors has expanded the possibilities of differential diagnosis of various forms of lesions of the sound-receiving apparatus. With the most careful differential diagnostic selection of patients with peripheral lesions of the sound-receiving apparatus, unlike the data of some previous researchers, we were unable to detect a significant increase in the magnitude of adaptation in these patients. The absence of a distinct increase in time with peripheral disorders of the sound-receiving apparatus makes it seem that the adaptation process develops in the overlying parts of the auditory analyzer.

The authors of single studies conducted on patients with brain tumors found an increase in RAT in most patients, including tumors of the posterior cranial fossa. It is quite obvious that the brain stem located in the posterior cranial fossa could not remain intact and in most cases was involved in the pathological process[7,9].

It can be assumed that with other localization of brain tumors, as a rule, functional, neurodynamic disorders occurred, resulting from compression, dislocation and hypoxia in the cortex, subcortical nodes, hypothalamic-pituitary system and other structures of the brain, which in turn could lead to the emergence of pathological adaptation. Despite the fact that the methods of measuring adaptation were almost identical, in this study it was not possible to detect an increase in RAT in a number of examined groups of patients with brain lesions. In particular, with lesions of the temporal, frontal, and parietal regions of the brain, the duration of the recovery process remained normal, which, apparently, is associated with the predominance of focal epilepsy among the patients we examined. This circumstance limited the localization of the lesion to a certain extent.

At certain localizations of the lesion of RAT in patients with focal epilepsy increased markedly, most of all it was expressed in lesions of diencephalic structures, the cerebellar angle and the brainstem. The fact that an increase in adaptation was observed in stem and diencephalic lesions suggests that the regulation of the recovery process after sound stimulation is provided by the stem and hypothalamic departments of the central nervous system. As for the increase in RAT in patients with lesions of the cerebellar angle, in some cases, such lesions also affect the brain stem. In favor of the assumption of the connection of adaptation with the stem and hypothalamic parts of the brain, the results of psychopharmacological experiments show that the magnitude of auditory adaptation is determined by the state of the nonspecific system of the reticular formation of the brain stem and the posterior hypothalamus.

Conclusions. Adaptation decreases markedly when taking drugs that suppress the activity of these structures and increases with the action of drugs that enhance the activity of the reticular formation and hypothalamus. Thus, auditory adaptation caused by moderate levels of sound stimulation can serve as an indicator characterizing the state of some central parts of the brain. All of the above suggests that the use of adaptation tests for the diagnosis of hearing organ lesions and for professional selection needs significant correction.

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СЛУХОВАЯ ПРИСПОСОБЛЕННОСТЬ ПАЦИЕНТОВ С ПЕРИФЕРИЧЕСКИМ И ЦЕНТРАЛЬНЫМ НАРУШЕНИЕМ СЛУХОВОЙ ФУНКЦИИ

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Резюме. *У 79 нормально слышащих и у 328 пациентов с периферическим и центральным нарушением слуха измеряли обратное время адаптации (ОВА) после 2-минутной стимуляции тоном 2000 Гц и интенсивностью выше порога слышимости на 60 дБ на той же частоте. Показано, что у больных с периферическим поражением звуковоспринимающего аппарата значение РАТ не отличалось от нормы. Установлено, что у больных с локальными поражениями головного мозга ОВА резко возрастала при поражении ствола головного мозга и диэнцефальных структур, а также в случаях, когда имеющееся поражение могло затрагивать эти структуры (мостомозжечковый угол). Этот тест предлагается использовать в общем комплексе отоневрологической диагностики локальных поражений головного мозга.*

Ключевые слова*: нейросенсорная тугоухость, аудиометрия, диэнцефальные структуры, мостомозжечковый угол.*